

# Wave Makers



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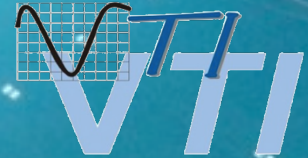


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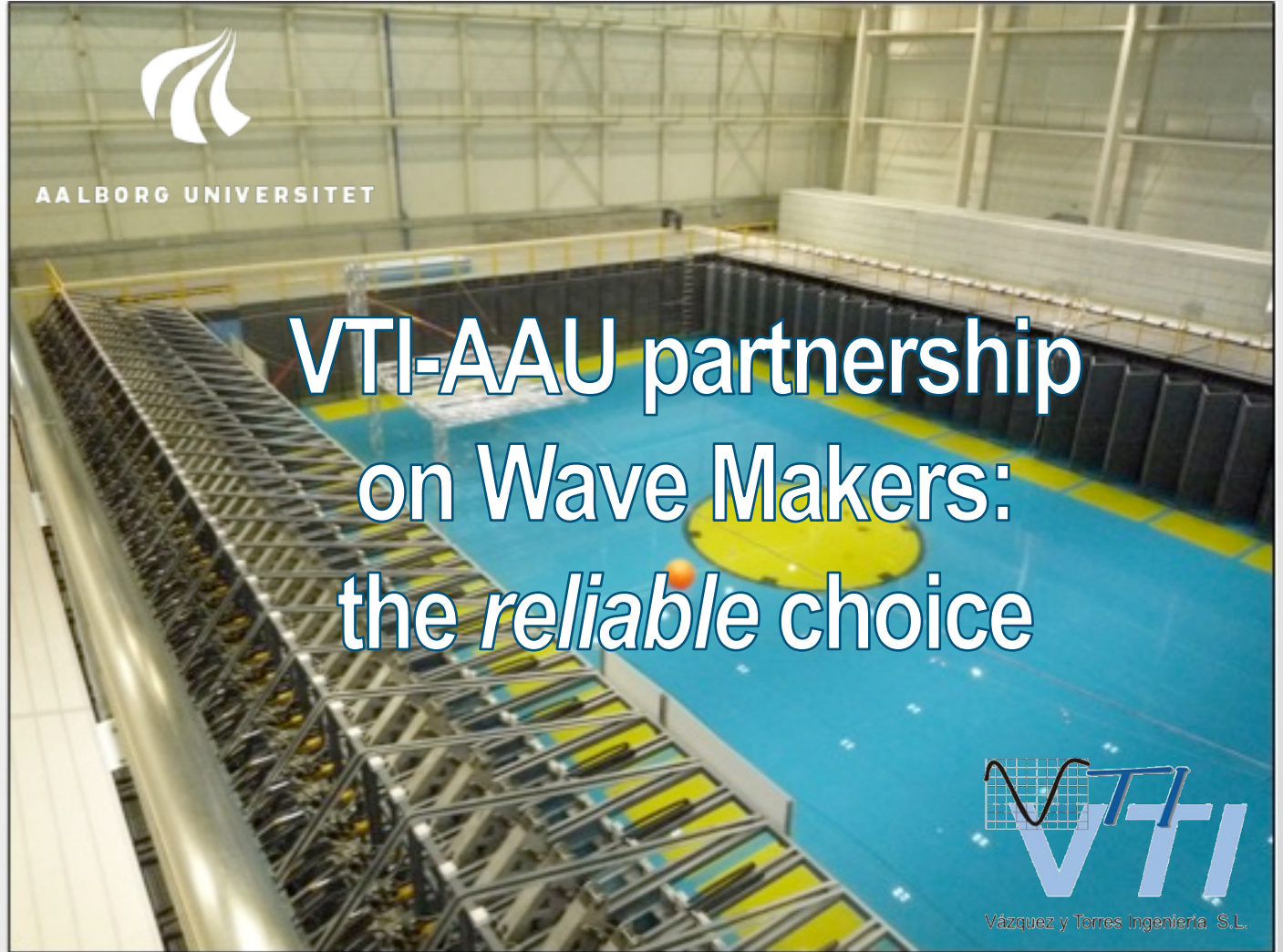


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## VTI-AAU partnership on Wave Makers: the *reliable* choice



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*R&D and Test Centers  
Private and Public Companies*

*Customized Testing &  
Equipment Needs*



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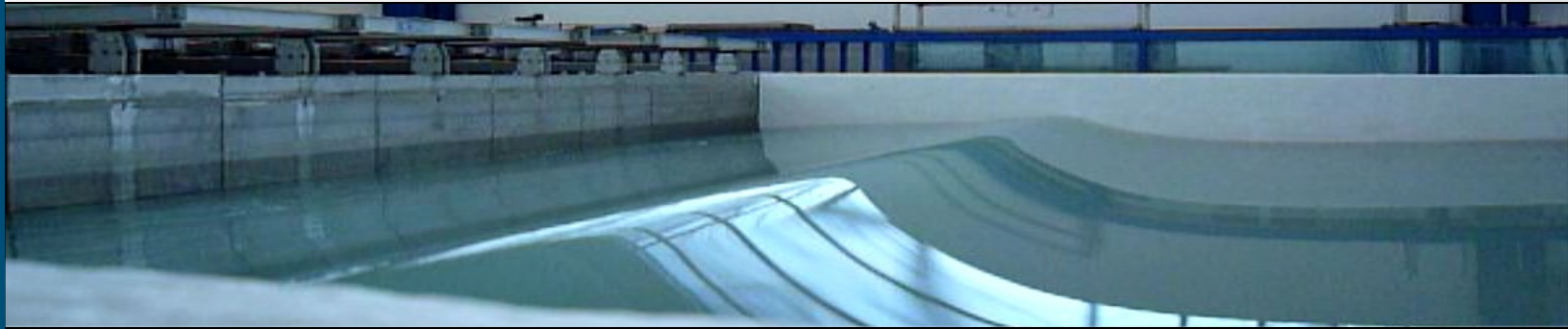
- Private **engineering** company established in Madrid in 2000
- Brand **new facilities** at Parque Tecnológico Leganés (Madrid) with 2.350 m<sup>2</sup> divided into offices and warehouse
- Referent in the design, manufacture and integration of mechanisms and test systems in the **highest technological** sectors: defense, aerospace, automotive...



R&D DESIGN INTEGRATION INSTALLATION



- **20+ systems installed**
  - Large scale and small scale wave makers
  - Single paddle and multi-paddle configurations
  - Flap, piston and combined movement mechanisms
  - Hydraulic and electric actuators



- **Customers** located in Spain, Denmark, Germany, Italy, Ireland, Japan, Uruguay, Chile and USA



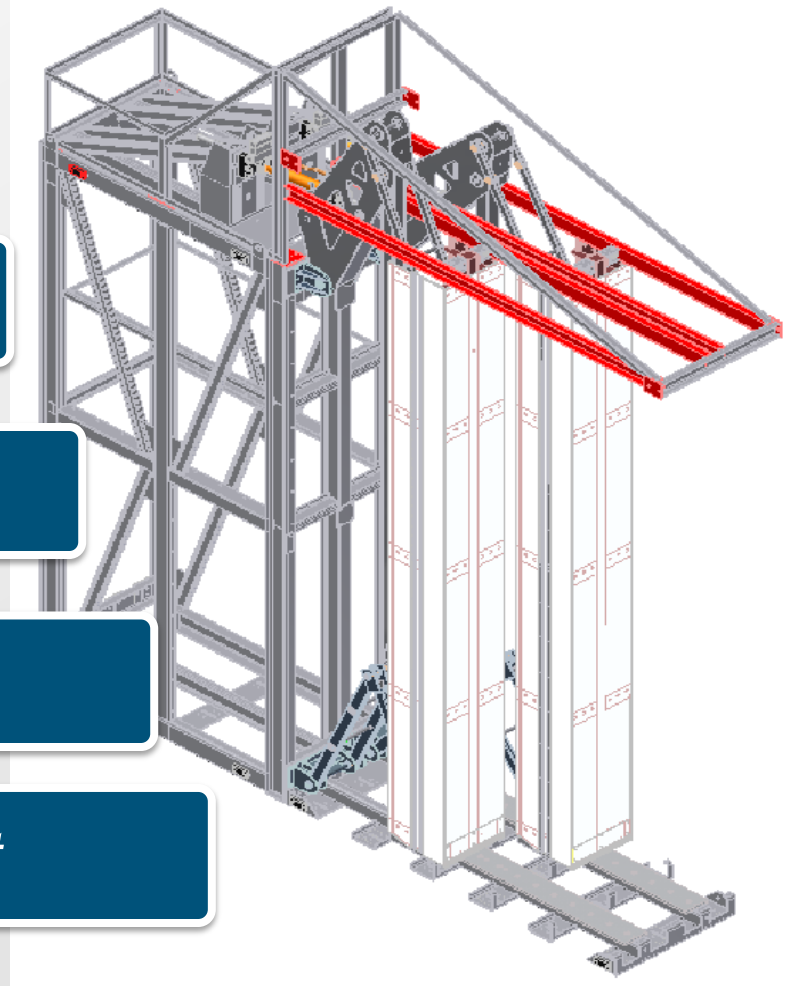
1. *Mechanical system*

2. *Control System*

3. *AwaSys*

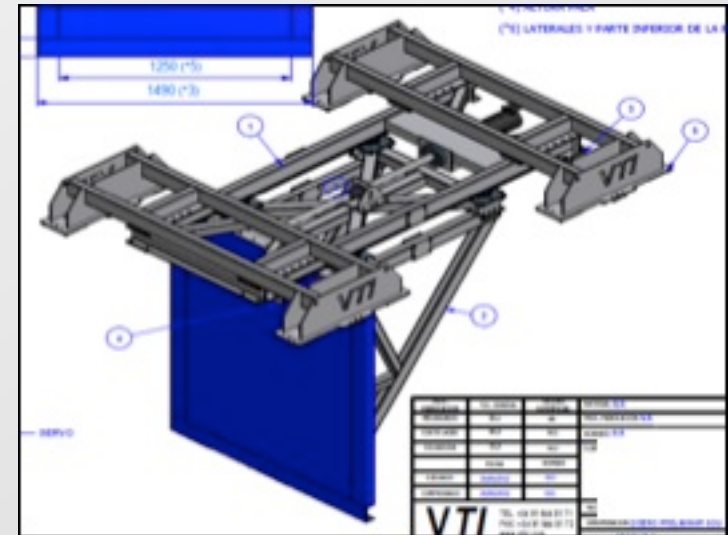
4. *Auxiliary Systems*

5. *Reference List*



## 1. Mechanical System

- **Strong** design with high life expectancy
- Very **accurate** wave generation due to high quality mechanical construction with minimum slack
- **Flap** type, **piston** type or combined mechanism
- **Dry-back** or **wet-back**
- Fix or movable set-up
- **Electric** or **hydraulic** high quality actuators
- Minimal maintenance work



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*Technical University of Braunschweig (Germany)*



*Universidad de Montevideo (Uruguay)*



*Escuela Ingenieros Navales Madrid (Spain)*

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*Instituto de Hidráulica Ambiental Cantabria (Spain)*

## 2. Control System

- Superb **proprietary control system** with VTI hardware and Windows® based VTI *WaveDesktop* software
- Extremely **fast feed-forward and back-forward control loop** for superior target position tracking and low delay for very high wave generation and active absorption quality
- Multiple **safety features** and auto check routines
- Specific communication protocol designed to work with **AwaSys**, adaptable to any other wave generation software
- Easily **adaptable** for upgrade of existing systems





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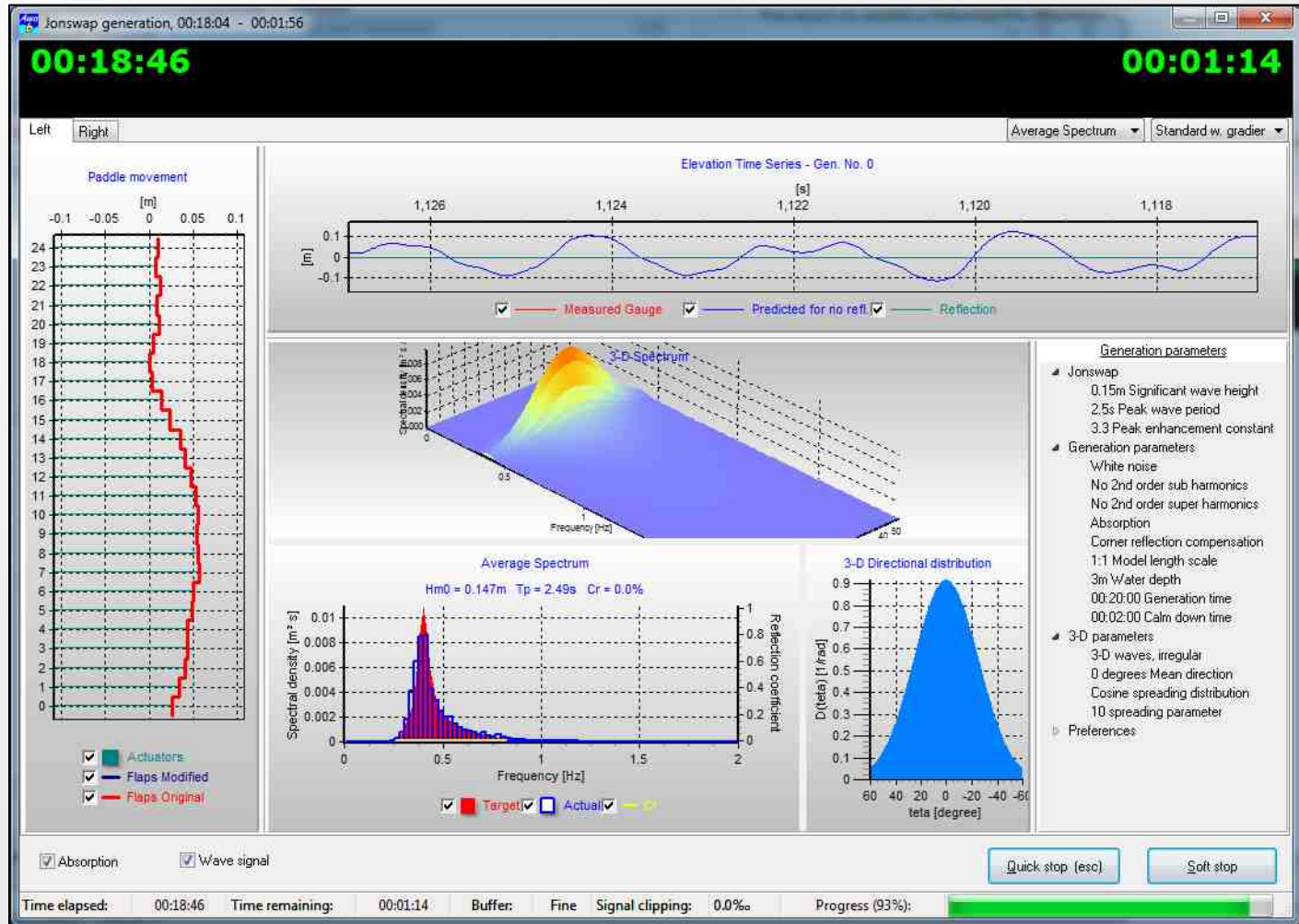


## 3. AwaSys

- Windows® based, user-friendly wave generation software with **most capabilities** and highest performance in the market
- 2D & 3D active **wave absorption**, easy to configure via software
- Allows the user to perform wave generation synthesis and simultaneously modify control signals according to an **active wave absorption loop**
- Wave generation process is visualised in **graphs** showing paddle movements, measured surface elevations and calculated incident wave spectrum



# 3. AwaSys



## 3. AwaSys

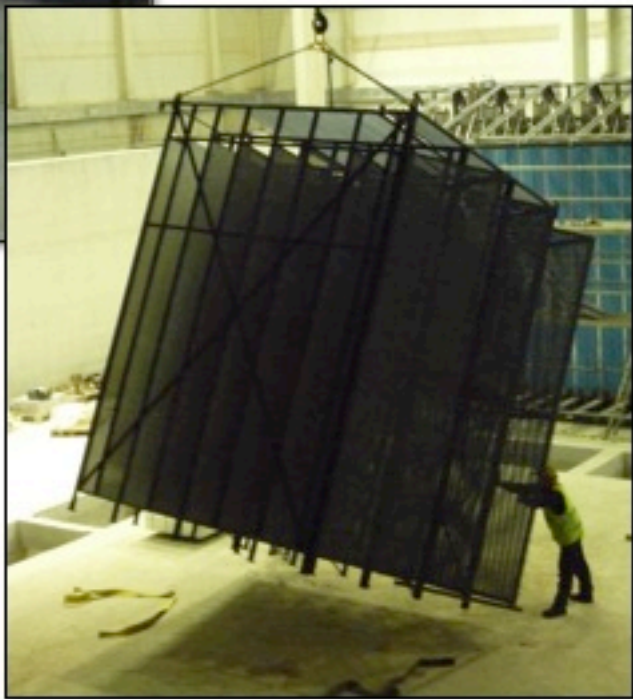
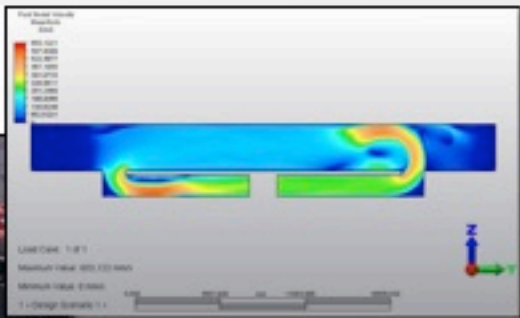
- **The following sea states can be generated in AwaSys:**
  - Regular waves
  - Irregular unidirectional and multidirectional waves according to predefined or user defined spectra
  - Irregular unidirectional and multidirectional waves with user defined wave train time series reproduced in a given point in the flume/basin
  - Solitary & freak waves (with given focus point in the flume/basin)
- **State-of-the-Art generation principles:**
  - Linear, 2nd order or stream function theory for generation of regular waves
  - Deterministic (Random phase) and non-deterministic (Filtered White Noise) methods for generation of irregular waves.
  - 2nd order correction for irregular waves (long-crested waves normal to the wave maker)
  - Corner reflection (Dalrymple) to largely increase area with correctly generated oblique and multidirectional waves

## 4. Auxiliary Systems

- **Data acquisition** systems & wave **analysis** software (**WaveLab**)
- **Passive absorption** systems (parabolic, honeycomb, tubular matrix, slit metal sheets)
- **Wind generation** systems, including wind tunnels
- VTI resistive **wave gauges** and water level measurement
- **Current generation** control and monitoring
- **Centralized control systems** that manage all aspects of a complex lab (wave maker, current generation, wind generation, power consumption monitoring, safety supervision, etc.)



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## 5. Reference List



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