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HYDRAULICS RESEARCH

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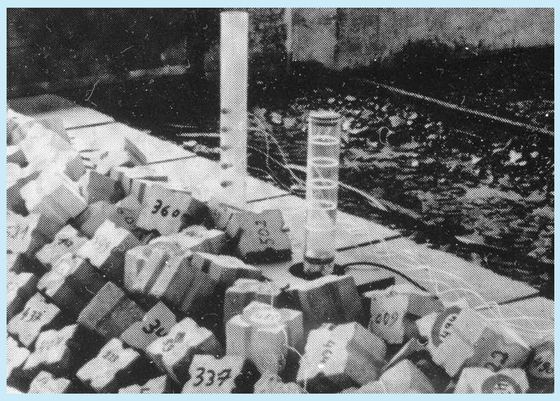
Wave flume and wave basin design of coastal structures in Flanders

The hydraulic design of coastal structures is a complex task. In the past decades physical scale models often were the only possibility to verify the design. Nowadays computer models are very powerful but some physical processes still cannot be calculated accurately. Therefore physical scale models are still intensively used as design tools in almost all major coastal engineering projects.

Since the 80's of the previous century Flanders Hydraulics Research has invested in 3 wave facilities: 2 wave flumes for two-dimensional scale models and 1 wave basin for three-dimensional scale models. The dimensions (L x W x D) of the small wave flume are 41m x 0.7m x 0.86m, the large wave flume 70m x 4m x 1.4m and the wave basin 17.5m x 12.2m x 0.45m.

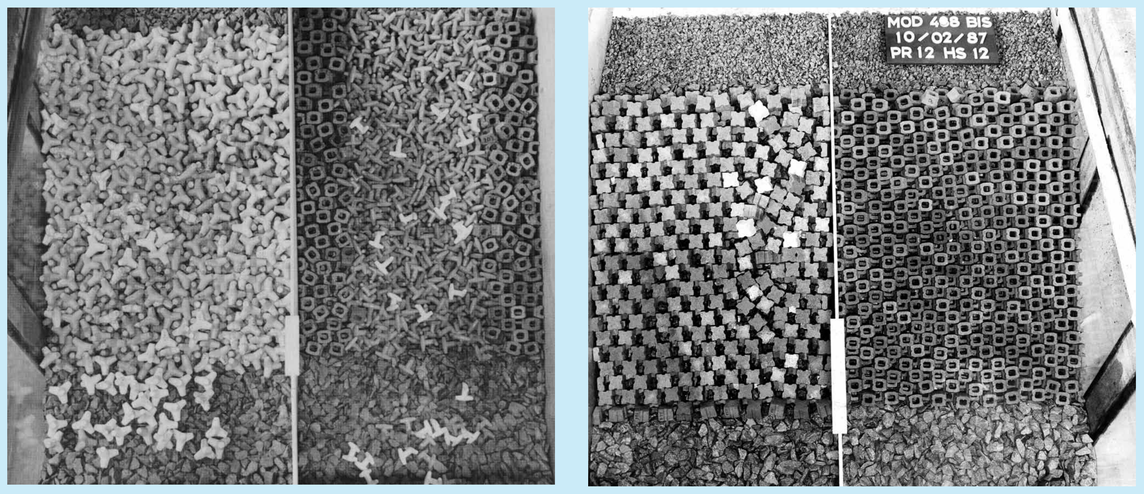
This poster gives a limited overview of some scale models dealing with research on coastal structures of Flanders Hydraulics Research.

Wave forces on wind turbines on top of the Zeebrugge breakwater [1985]



Pressure cells in a first mast registered water pressures caused by wave overtopping at different levels above the foundation. A second mast in the model was connected at the foundation with a leaf spring (with strain gauge) to measure the moment at the bottom of the mast.

Comparative research on the hydraulic stability of different armour units [1987]



In the large wave flume comparative hydraulic stability tests were performed for 4 different armour units : Tetrapode, Dolos, Antifer cube and Haro. The stability factor K_d of the armour units, the wave run-up on top of the armour layer and the wave reflection of the armour layer were investigated.

Wave overtopping at Ostia yacht harbour (Clash – crest level assessment of coastal structures) [2004]

FHR was partner in the European research project CLASH. In a 3D physical model wave overtopping at Ostia yacht harbour (Italy) was simulated and compared to overtopping measured in Ostia.

Wave run-up at Zeebrugge breakwater (Opticrest – optimisation of crest level design) [2000]

FHR was partner in the European research project OPTICREST. In a 2D physical model the wave run-up at the Zeebrugge breakwater was modelled and compared to run-up measured in Zeebrugge.

Hydraulic stability of beach profiles in Knokke-Zoute [2001]

Extensive 2D and 3D model tests proved that the combination of cross-shore wave attack and longshore tidal current is responsible for the continuous erosion at the beach of Knokke-Zoute. Also the most stable nourishment profile was examined.

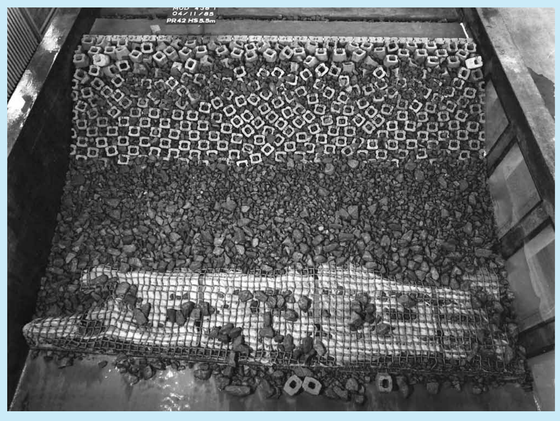
Stability of the Zeebrugge breakwaters [1985]

In the large wave flume the cross-section of the design of the new Zeebrugge breakwaters was modelled (scale 1:20). The hydraulic stability of the crest, armour layer (Antifer cubes, 25 T), filter layer (rock, 1-3 T) and toe (rock, 3-6 T) was investigated.

Wave penetration in the port of Oostende [2009]

For the design of a new port entrance, measurements in a 3D physical model were combined with calculations of numerical models to obtain the most accurate results for the wave penetration into the port.

Stability of 'Binnenrede' in port of Zeebrugge [1985-1987]



2 new quays in the inner port of Zeebrugge had been designed with the new hollow Haro® block. The hydraulic stability was investigated in 2D and 3D scale models (perpendicular and oblique wave attack). The results led to an optimised cross-section and proved the optimal pattern of the Haro blocks in the top layer.

Wave overtopping at Zeeheldenplein Oostende [2008]

To reduce wave overtopping at the sea dike in Oostende (Zeeheldenplein), the design of a new sea dike was optimised based on many overtopping tests in the large wave flume. The overtopping discharge in storm conditions was measured and evaluated.

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