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the costs derived from their maintenance and repair. The design minimizes the risk of breaking of slope docks as they are more resistant against swell energy. Marine docks construction has traditionally encountered problems derived from swell-produced breking, especially in

the event of great storms. The economic spending to repair the damage is very high and it affects ports, promenades or beaches. The most recent case in Spain was the storm of March 2008, which caused considerable material damage in the coasts of the Bay of Biscay.

A new design will permit to build slope marine docks with less risk of damage, in order to reduce the costs of construction, maintenance and upkeep of such maritime structures.

www.limongrafica.com "We have designated this new structure 'S", says María Clavero Gilabert, a member of the Group of Dynamics of Environmental Flows in the Andalusian Centre for Environmetal Studies (CEAMA-University of Granada, Spain), supervised by Dr. Miguel Losada Rodríguez.

According to the researcher, this study "is focused on the optimization of the typology of slope marine docks in order to lessen their main damage, the extraction of pieces from the external layer (loss of the blocks which Project the dock against

At present, these structures have been designed in such a way that there may be

serious damage in case swell grows stronger than that predicted in the design. Thanks to the results of this work, it is possible to design slope docks which remain

swell).

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absolutely steady up to the design swell and, in case of stronger swell, it i sable to adapt and therefore they do not suffer this problem". It is possible for docks to reduce swell energy without breaking, with the consequent benefit for the areas to be protected.

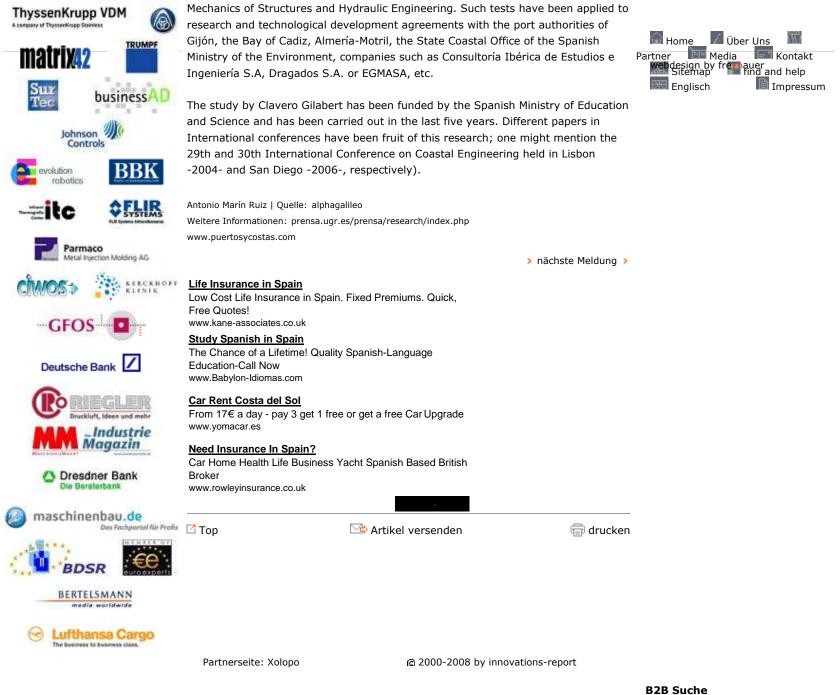
Swell Canal

CALCELLS The research work to improve maritime structures has been developed from the tests carried out in the Swell Canal of the CEAMA. It was necessary to "construct slope docks to scale with homogeneous pieces of concrete cubes and carry out tests with incident swells and growing waves, so that the dock became distorted until a balance or stable profile for such wave height was reached", says María Clavero.



The Swell-Current Canal of the CEAMA, which allows to carry out experiments on a large scale, is one of the most important in Spain; it is 23 metres long, cashiers are one meter high and it is 0.65 metres wide. This "laboratory" has been used quite

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