The new U-Oscillating Water Column breakwater of the commercial harbour of Salerno for the wave energy conversion

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Port of Salerno (Italy)

Commercial port Central and South Italy

Area of 1,700,000 m^2, 500,000 m^2 of which on land

5 docks

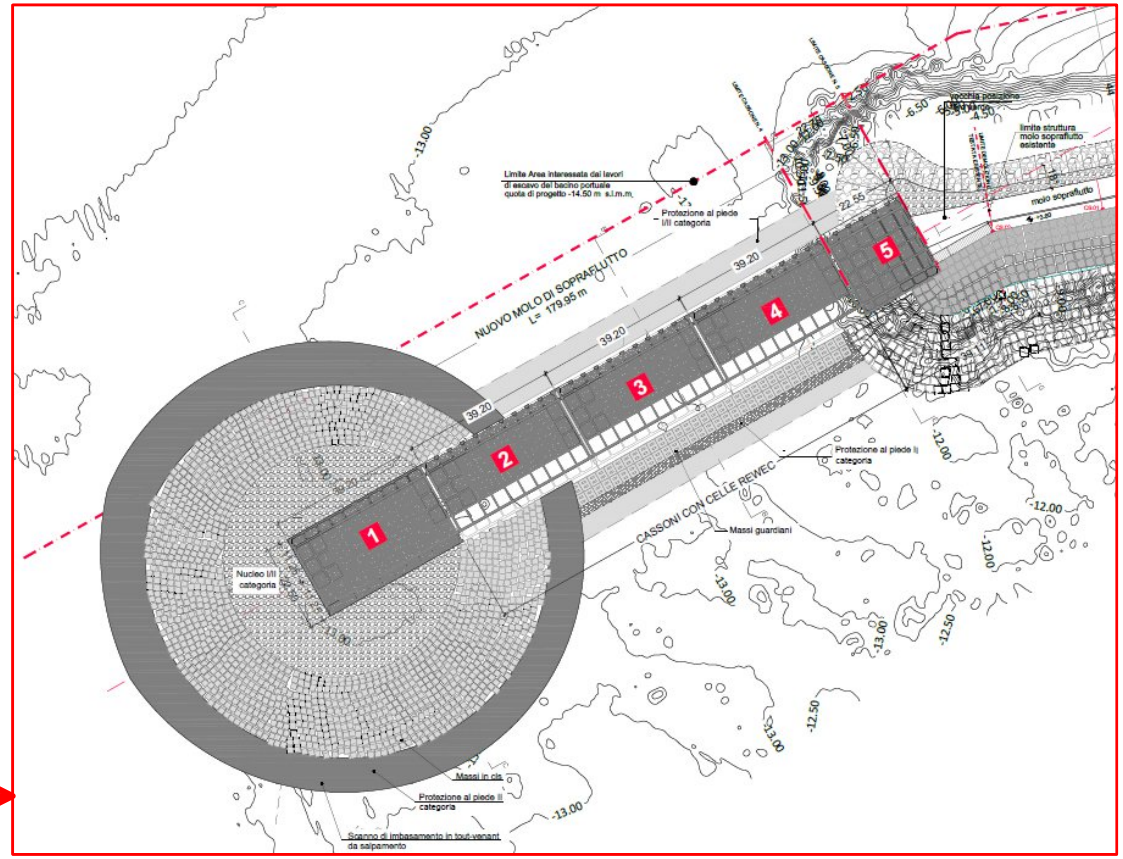
In 2020, almost 26×10^6 tonnes of goods and more than 3 million passengers

Breakwaters modifications

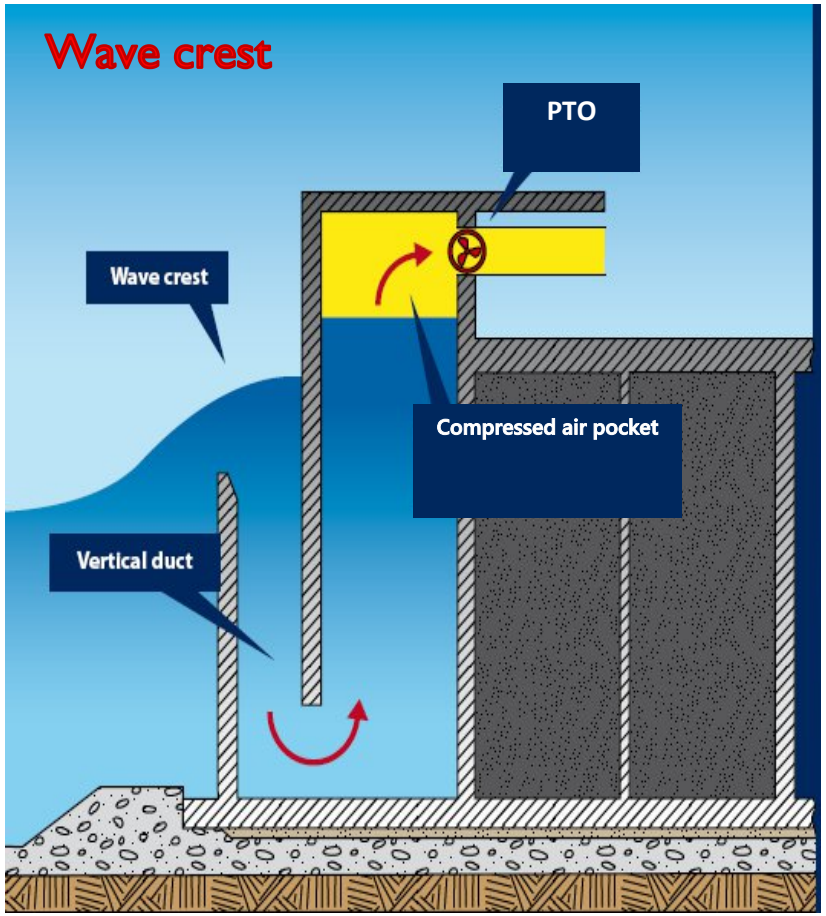
Enlargement of the breakwater (200m)

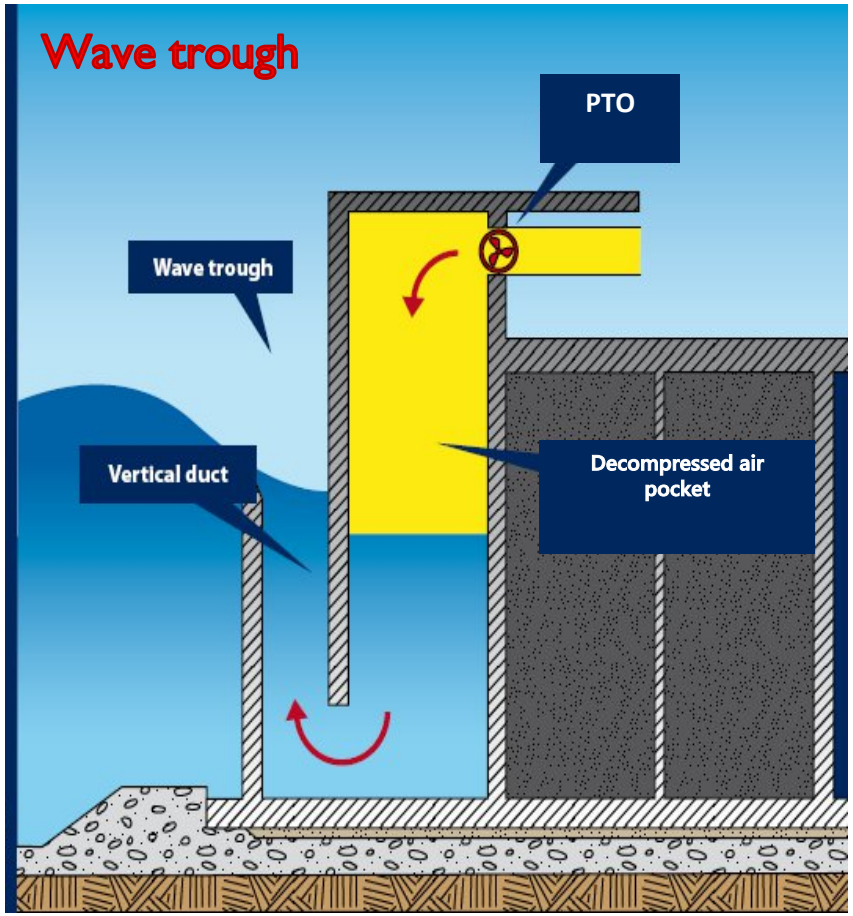
3 REWEC3 caissons

10 active chamber per caisson



REWEC3: brief overview





Oscillating water column

Small vertical U-shaped duct (U-OWC)

Achievement of the natural resonance without the use of any phase control devices

Simple and solide infrastructure

Absence of moving parts into water

Construction phase

Start = January 2021

End = April 2022

DARIO dry dock from Fincosit srl

Prefabrication from the base up to the level corresponding to +0.80m m.w.l

Transportation to the final position

Finalization of the construction on site

Construction phase

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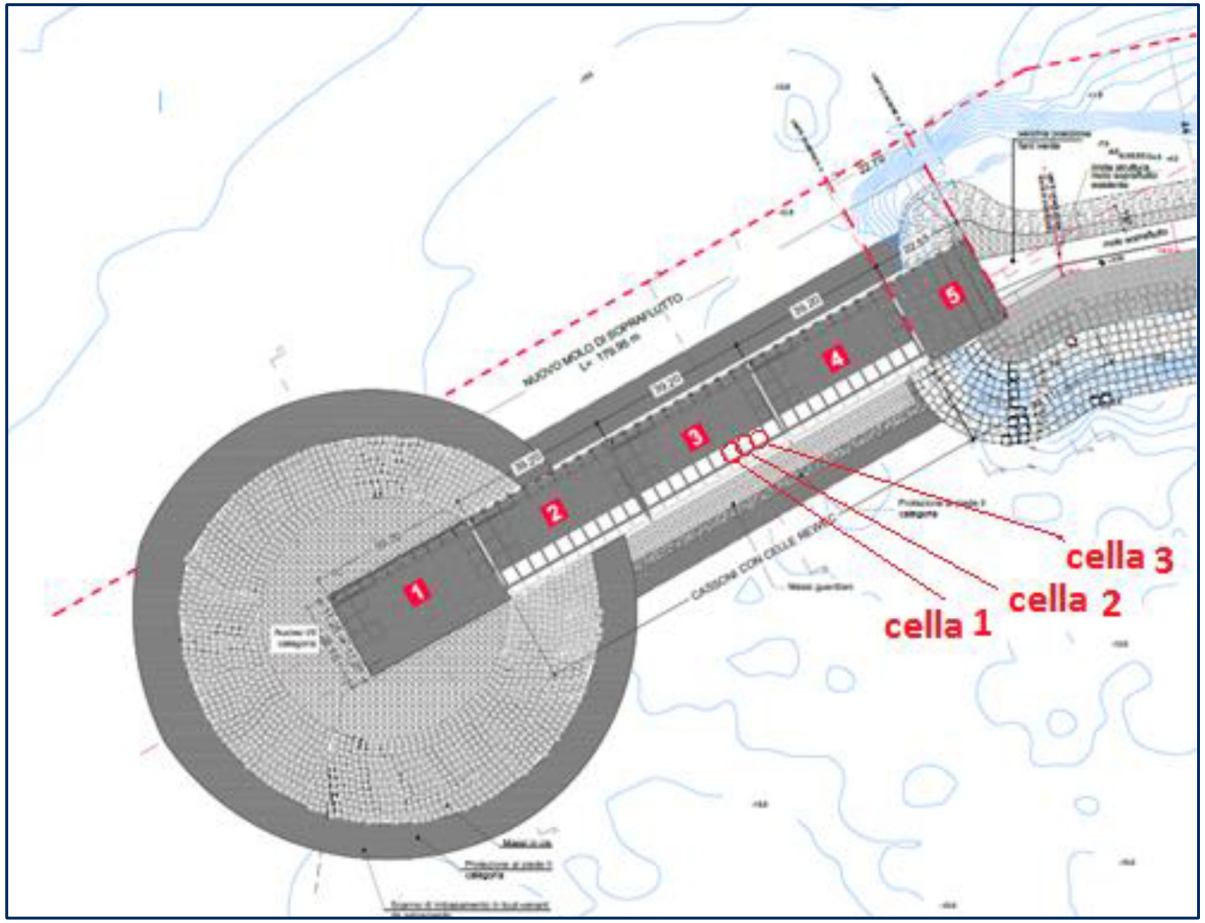
Monitoring activity



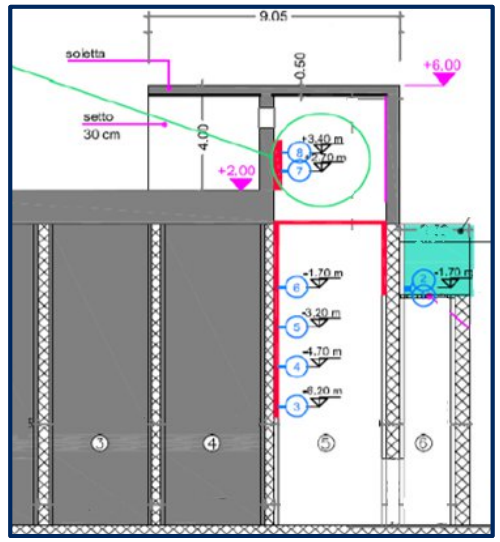
Chambers n.1 – n.3

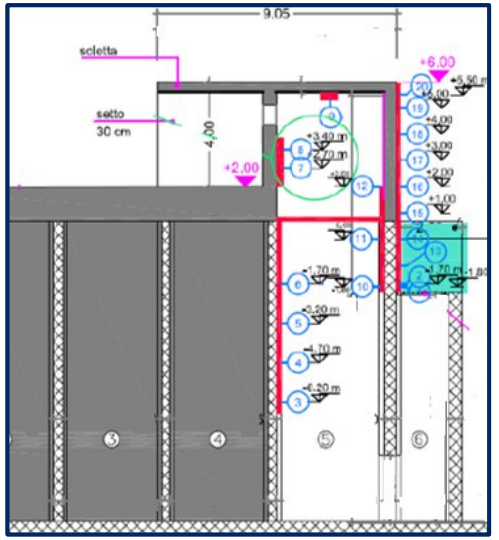
8 pressure transducers

Chamber n.2

19 pressure transducers

1 ultrasonic probe





Data evaluation

$$<\Phi_p>=-b_3 b_2 \frac{1}{T}\int_0^T\left[\Delta p+\frac{1}{2}\rho\dot{\xi}^2\left(\frac{b_2}{b_1}\right)\right]\dot{\xi}\,\mathrm{d}t$$

Average absorbed power

Boccotti *et al*. (2007); Arena *et al*. (2013, 2017, 2018)

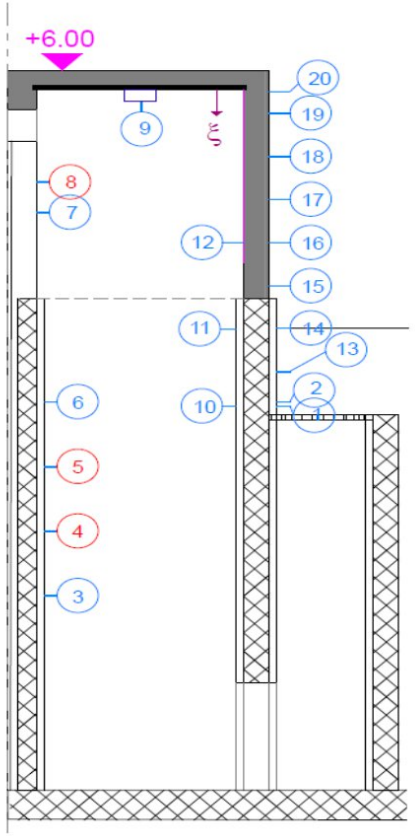
$$<\Phi_{inc}>=\frac{\rho g^2}{64\pi}\alpha_{f_2}H_s^2 T_p$$

Average incident power per unit length of a wave front

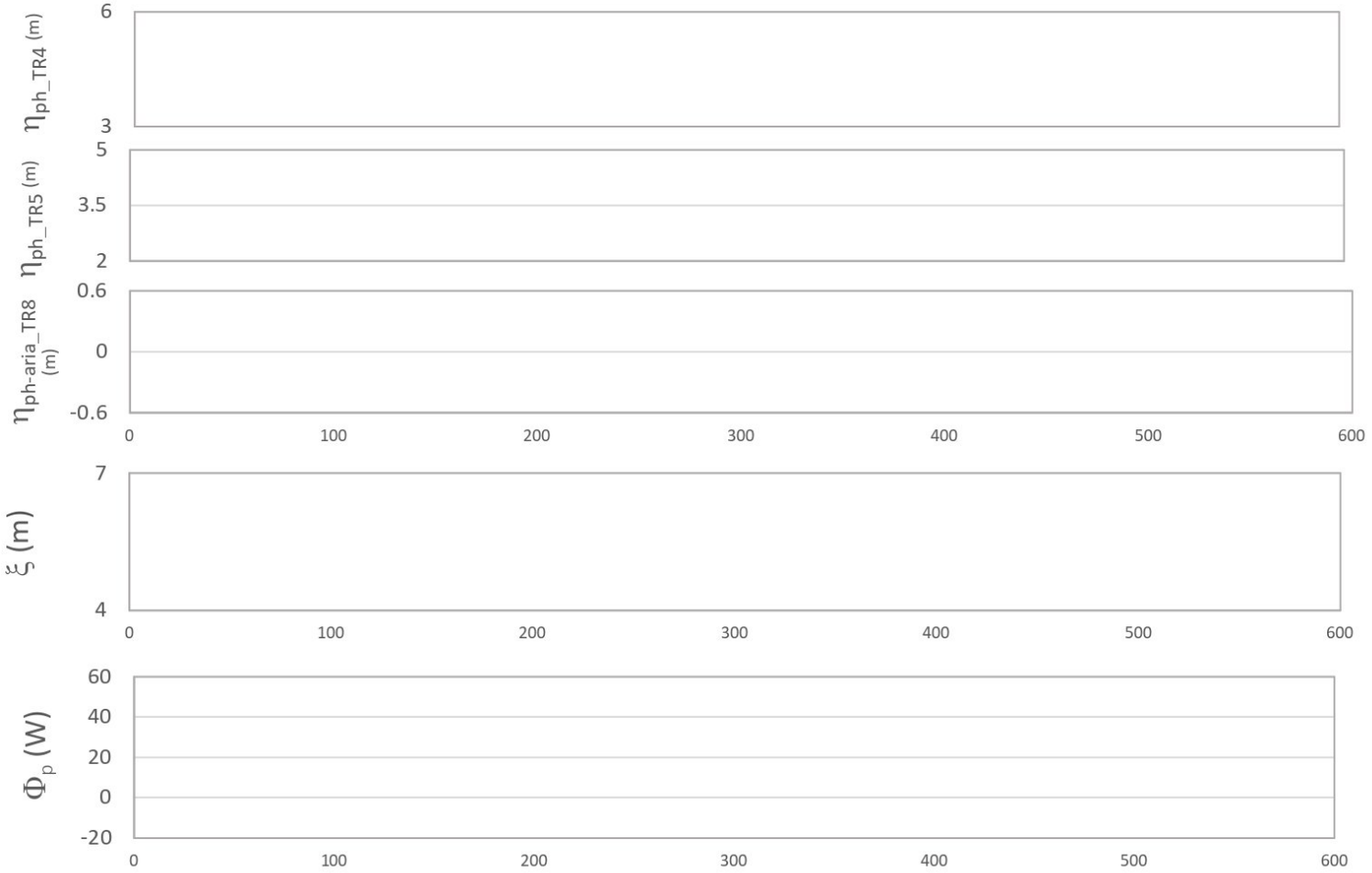
$$C_a=\frac{<\Phi_p>}{<\Phi_{inc}>}$$

Capture width ratio

Results



RECORD 1364



H_s equal to 1.25m

T_p equal to 5s

$$C_a = \frac{<\Phi_p>}{<\Phi_{inc}>} > 86\%$$

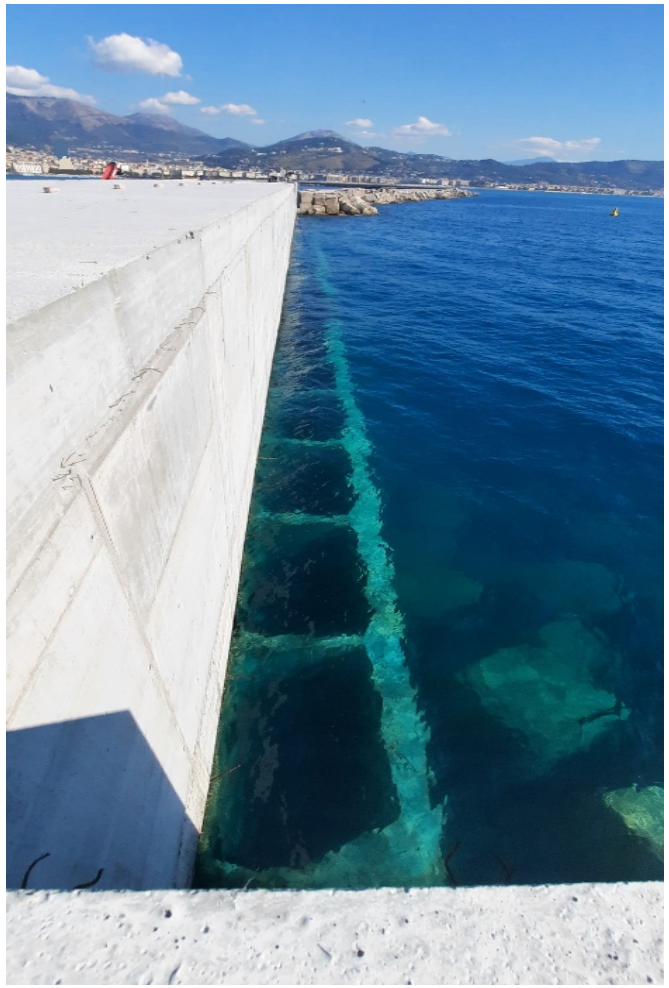
Results

REWEC3 system can absorb on average from 60% to 98% of the incident wave energy with significant height greater than 1m.

The capture width ratio C_a factor is less than 0.5 only for 15% of the set of records analysed, having H_s < 1m

Future steps

- Monitoring activity
- Installation of an optimized PTO



Thanks

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