Experiences from developing commercial wave energy systems

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"Wave Energy in Portugal in the International Context"

Lisbon, Portugal

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Fred. Olsen - building on experience and diversity during 160 years
- and adding new opportunities to the portfolio
Marine renewable energy – not if, but how

We will need all possible sources of renewable energy in operation

- It will take a long time to achieve full commercialization
- It will cost more than we calculate today
- There will be failures and unsuccessful trials
- The final results will be significantly different from what believe now
- Many factors other than technology will be critical for success
The FO Wave Energy project – a “step by step” and “learning by doing” development process

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1:3 system and production tests in the Wave Tank

Wave tests with three floats in row.

Actual power production from one test sequence
Regular inspections give valuable feedback and design input

- Choice of GRP has proven right
  - Little fouling, no crack indications, low stresses, easy maintenance

- Unexpected pitting corrosion on steel guide
  - Quality of steel delivered?

- Mooring fairleads OK – mooring breakage due to rope manufacturer failure
  - DNV Investigation

- Choice of bearing material
  - several alternatives tested

- General maintenance strategy development
  - low maintenance requirement – so far....
Our Norwegian land-based field test site
Field testing – results and practical issues

- High peak to average production differences (15 to 1 !)
- Extreme structural loads - slamming
- Durability of components and systems
- Installation and operational procedures
- Control systems and hydrodynamic modelling
Practical field testing

• 8 kW autonomous buoy
• Electricity production, conversion and storage + excess burn-off
• Data communication; web operated
• Trials of primary PTO system; choice of materials and components; control and communication
• Installation and marine operations
• All control systems are the same as for the full scale unit
Valuable field test results

Each point in the graph represents an average over 20 minutes.

- Absorbed power
- Accumulated energy
- Significant wave height
Moving towards field testing on a commercial scale

- Single point moored buoy using the point absorber principle
- Autonomous operation – built on experiences from the B22 field tests
- 40 kW installed capacity
- Fully designed and engineered for long term operation
- Will experience modifications, interruptions, and a number of known and unknown challenges
**Technical and non-technical challenges**

- Financing of the development work – and too aggressive marketing in the process
- An over-cautious approach from third parties on environmental issues
- Not utilizing existing research, competences and experiences
- Too little industrial collaboration yet within marine renewables and between industries in general (Portugal is a good exception!)
- Lack of good and cheap test facilities in the sea
- Too little practical field testing and trials
- Too few failures (or unsuccessful research) published
Is this what it will look like in 2015?