

A

Seminar report

On

Soil Liquefaction

Submitted in partial fulfillment of the requirement for the award of degree
of MCA

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Preface

I have made this report file on the topic **Wave Energy**; I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude towho assisting me throughout the preparation of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

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ABSTRACT

The Pelamis P-750 wave energy converter is the production version of the Pelamis project. Pelamis Wave Power Ltd is the manufacturer of a unique system to generate renewable electricity from ocean waves. Pelamis converts up to 80% of the energy produced by the ocean surface waves into electrical energy. It is an attenuating wave energy converter designed with survivability at the fore. The machine is made up of connected sections which flex and bend as waves pass; it is this motion which is used to generate electricity.

The overall rating of Pelamis P-750 wave converter is 750kW. The average amount of power generated per month is 15GW. This renewable, non-polluting and climatically compatible energy source is sure to trigger growing interest in harnessing water power in years ahead.

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1. INTRODUCTION

In recent years, there has been an increasing emphasis on sustainable-energy sources as part of ongoing efforts to combat climate change. The greatest success in the history of sustainable energy is hydroelectric power, which has been performing reliably for over 100 years. And more-recent technology effectively harnesses wind power, both on land and offshore. Harvesting ocean energy is not a new concept, yet it has remained a marginal resource. Today there is serious interest in offshore technology.

So now the question which arises is “What is Wave Energy (or) Offshore Energy”

WAVE ENERGY:

- Wave energy refers to the energy of the ocean surface waves and the capture of that energy to do any useful work.
- It is a clean and renewable energy source and its potential is huge.
- It is a free and renewable energy source.
- Pollution free.

Sea waves are very promising energy carrier among renewable power sources. The global theoretical energy from waves corresponds to 8×10^6 TWh/year, which is about 100 times the total hydroelectricity generation of the whole planet. It is estimated that only 10 to 15% can be converted into electrical energy, which is a vast source of energy, able to feed the present all world. Offshore wave energy has the potential to be one of the most environmentally benign forms of electricity generation.

TECHNOLOGIES USED IN WAVE ENERGY CONVERSION (WEC)

- PELAMIS
- WAVE STAR
- WAVE DRAGON
- WAVE ROTOR

PELAMIS WAVE ENERGY CONVERTOR

Pelamis Wave Power (PWP) Ltd. is the manufacturer of a unique system to generate renewable electricity from ocean waves. For energy companies, utilities and their customers, Pelamis machines offer the ability to unlock an immense clean energy resource with great potential.

The Pelamis Wave Energy Converter technology uses the motion of ocean surface waves to create electricity. It is unique among systems under development. The name Pelamis is basically a Greek word derived from the name of a Sea Snake. It is a semi-submerged wave energy converter with a simple geometry configuration based on individual cylindrical segments linked linearly by hinged joints.

The Pelamis P-750 Wave Energy Converter is the result of extensive testing, modelling and development by Pelamis Wave Power (PWP). It is the world's first commercial scale machine to generate electricity to the grid from offshore wave energy and the first to be used commercially.

. CONSTRUCTION:

Pelamis P-750 wave energy converter mainly consists of two segments:

- Main tube segment
- Power conversion module

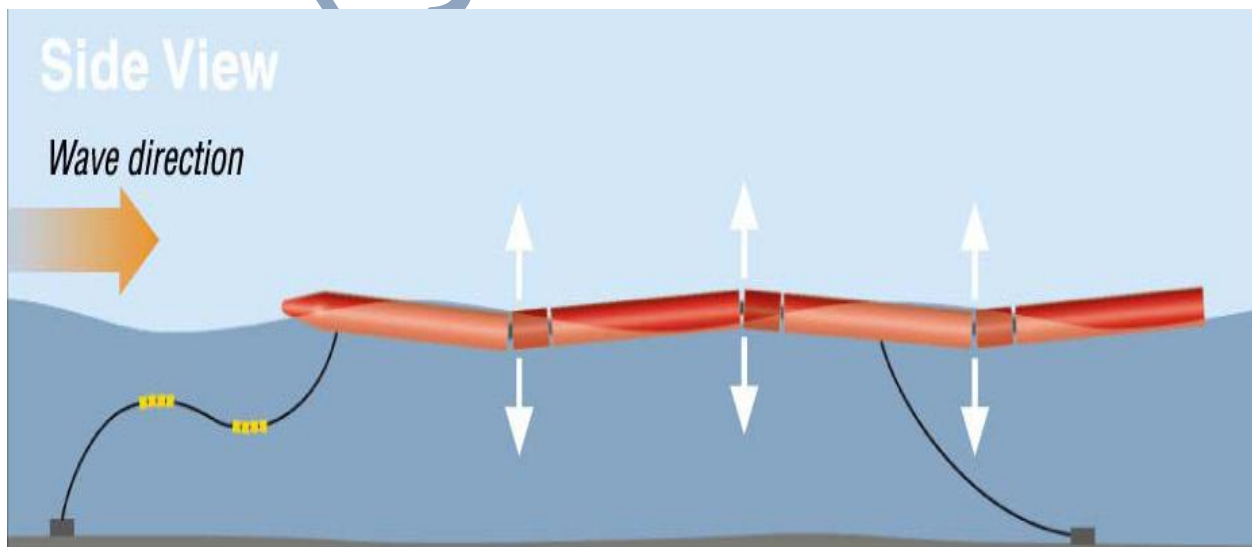
MAIN TUBE SEGMENT

The main tube is a semi submerged articulated cylinder linked by hinged joints which swings head-on to incident waves. The cylinder has a length of 140m and a diameter of 3.5m. It has 4 main segments and 3 joints. This forms the body of the Pelamis wave energy converter device.

The segments are cylindrical and tubular.

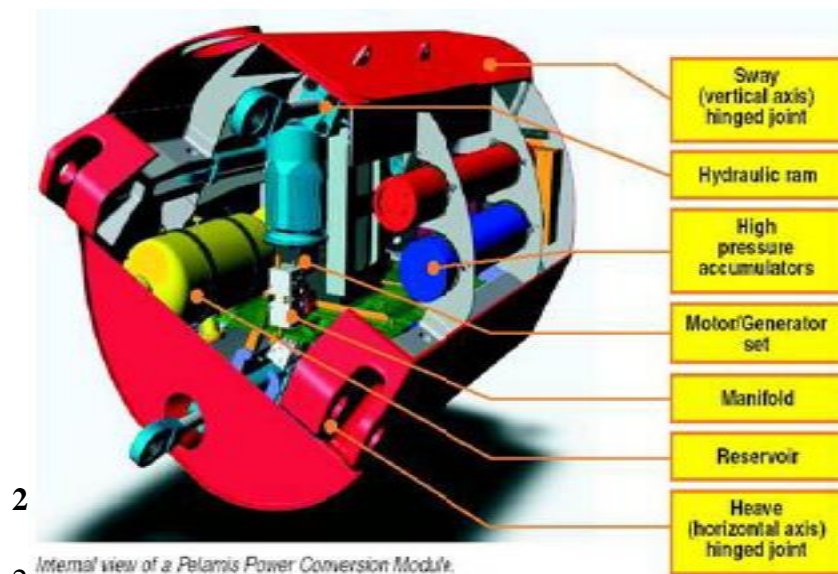
The front segment consists of a nose 5m long, drooped conical such that it is streamlined for proper distribution of the wave impact.

A transformer is present at the front segment.



POWER CONVERSION MODULE

The power conversion module mainly consists of sway hinged joints, hydraulic rams, high pressure accumulators, motor/generator set, main fold, reservoir and heave hinged joint. The Pelamis contains three Power Conversion Modules, each rated at 250kW.



2 Internal view of a Pelamis Power Conversion Module.

Overall length : 150m
Diameter : 3.5m
Displacement : 700 tonnes (including ballast)
Nose : 5m long, drooped conical
Power take off : 3 independent power conversion units.

2.1.2. Power conversion unit:

Power take off	: 4 x hydraulic rams
Ram speed	: 0 – 0.1m/s
Power smoothing/storage	: High pressure accumulators
Working pressure	: 100 – 350 Bar
Power conversion	: 2 x variable Displacement motors

Generator	: 2 x 157kVA / 125kW
Speed	: 1500rpm

3. OPERATION:

The Pelamis device, a design by Ocean Power Delivery (OPD) Ltd of Scotland, is made up of four hollow steel cylinders which are linked by hinged joints. At each joint is a power conversion module (PCM), which houses all the generation components, including the hydraulic motor and electrical generators. When the joints flex, either heaving (vertical motion) or swaying (horizontal motion), the motion is resisted by hydraulic rams, and high-pressure oil is pumped through smoothing accumulators and then through a hydraulic motor. This motor then drives an electric generator, producing electricity. Figure 1.0 shows the design of the Pelamis device.

The Pelamis WEC is slack-moored, with enough freedom for the device to swing in the direction of incoming waves, though it is tethered at both the front and the back to prevent any full 360° rotations. If multiple Pelamis devices operate in a cluster, they can be daisy-chained together with jumper cables; thus, the Pelamis devices can be wired such that only one connection is needed to a sub-sea junction box, where the connection is made to a cable running along the sea floor. The electrical connections are made right on the Pelamis device, avoiding the need for dive teams or automated underwater vehicles once the initial connection to the sub-sea junction box has been made. In this way, maintenance crews have easier access to most of the cables which interconnect the Pelamis devices.

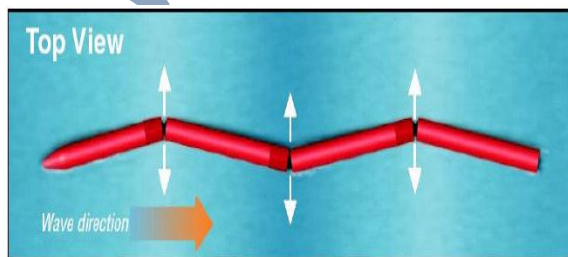


Fig.1.Top view of pelamis device

The overall length of the Pelamis device is optimized for the predominant wave conditions at the site for which it is destined.

The Pelamis is designed to be moored in waters approximately 50-70m in depth (typically 5-10km from the shore) where the high energy levels found in

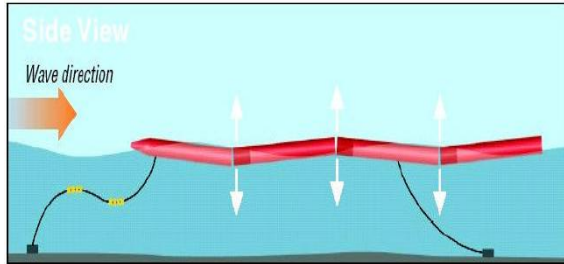
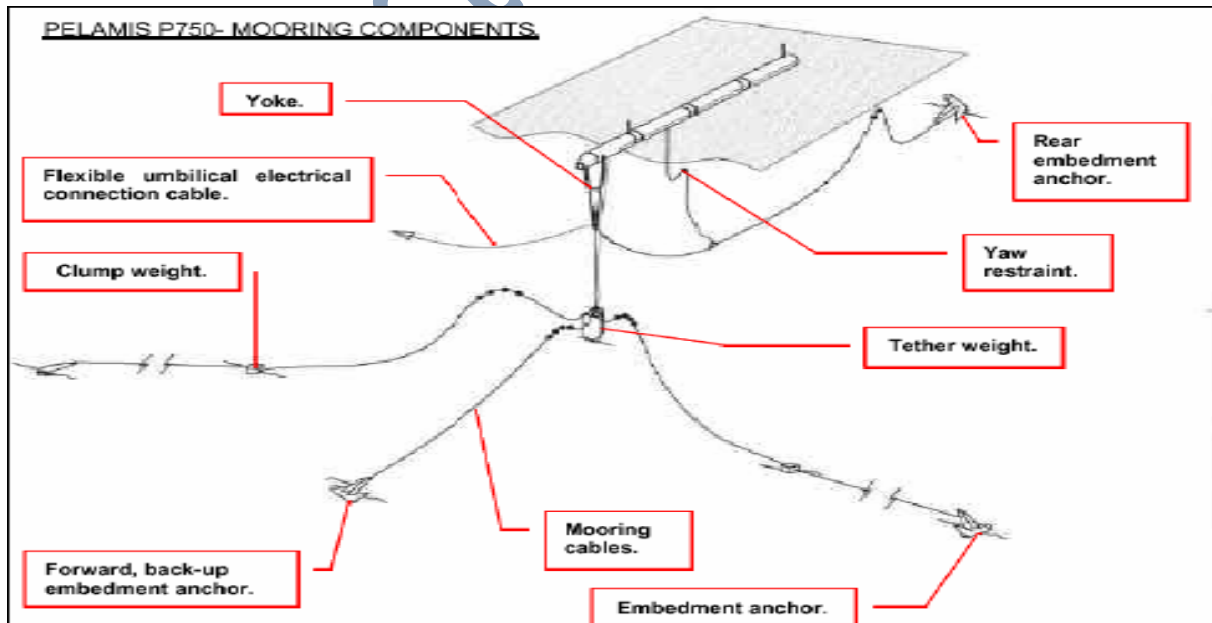


Fig. 2.side view of pelamis device

deep swell waves can be accessed.

The complete machine is flexibly moored so as to swing head on to the incoming waves and derives its 'reference' from spanning successive wave crests.



4. KEY FEATURES:

- SURVIVABILITY

The core theme of the Pelamis WEC concept is survivability. All Wave Energy Converters absorb power in small waves through HYDROSTATIC forces – that is buoyancy versus weight or hydrostatic pressure. However extreme loads in waves arise from the HYDRODYNAMIC forces, namely inertia, drag and slamming. The Pelamis is very strongly coupled hydrostatically but is almost invisible to large hydrodynamic effects.

- HIGHEST SPECIFIC POWER RATING

The long thin form of Pelamis gives it highest water plane area to volume ratio of any WEC system.

Water plane area is the primary driver for power capture in small sea.

- POWER LIMITING

Peak energy levels in storm conditions are typically 100 times that encountered in normal operation.

Pelamis achieves power limiting as wave height increases by smoothly and progressively locally submerging and emerging locally down the length of the machine.

This self-limits the load, motions and therefore absorbed power, as wave height increases further.

- 100% AVAILABLE TECHNOLOGY

The Pelamis is an assembly of proven technology from the offshore oil and gas sector.

- NON SITE SPECIFIC

The Pelamis is designed for offshore locations with water depths of 50 –70m, giving maximum flexibility and scalability. The Pelamis can be installed in a range of water depths and seabed conditions mainly 50m to 70m depth of the sea. Pelamis machines is reduced such that the machine's performance is continually improved, maintaining the existing competitive advantage.

- MINIMUM ON-SITE WORK

The Pelamis is constructed, tested and maintained off-site with a minimum of installation work required on-site.

- POWER CAPTURE EFFICIENCY

The Pelamis can be tuned to match conditions and optimise energy extraction.

- IMPACT ON THE ENVIRONMENT

- This device is found to be most eco friendly in all respects.
- Since it never resist the flow of the wave ,it creates least disturbance to marine life .
- The hydraulic fluid is extremely in toxic and biodegradable.
- This system has 0% carbon emissions and hence it makes environment clean and green.

5. MAINTENANCE:

The Pelamis is designed with a rapid attachment/detachment system which allows machines to be towed back to sheltered water for maintenance. The system is designed to avoid the use of specialist equipment, divers or ROVs. All maintenance activities are able to be carried out with the machine afloat at a quayside location.

Pelamis Wave Power has developed a unique system for quickly and safely installing and removing the machine from its anchoring system and electrical connection. The system allows the machine to be connected to its mooring and electrical system in around 90 minutes and disconnected in less than 15 minutes.

This 'plug and play' system provides huge advantages to both the installation and maintenance of Pelamis machines. No need for specialised vessels ensures that our approach to offsite maintenance is cost-effective.

Most importantly, the remotely controlled system is also significantly safer than other installation techniques, removing any need for dangerous diving activity, heavy lifting operations, tight lines on vessels, or personnel transfers.

This patented system can be operated in a wide range of weather conditions.

6. CURRENT MARKET:

❖ Aguçadoura

Under this project three P1-A Pelamis machines having a capacity of 2.25MW were installed 5km off the Atlantic coastline of northern Portugal. Aguçadoura was the location of the world's first wave farm

❖ Aegir-Shetland

It is located 1-10km off the west coast of main Shetland, Scotland. Under this up to 26 Pelamis machines of capacity 20MW were installed.

Shetland has been selected as a key strategic location for deployment of wave power technology due to the world class resource, combined with the existing skill set and infrastructure that complement the future requirements of the nascent marine energy industry. The current plans for a HVDC link to allow electricity export from Shetland to the Scottish mainland has made a commercial scale wave energy project on Shetland possible.

❖ Bernera wave farm

Pelamis Wave Power (PWP) Ltd. is planning to install up to 26 Pelamis machines of capacity 20MW off the west coast of Great Bernera, West Isles Scotland.

7. MERITS & DEMERITS OF PELAMIS WE

MERITS

- Robustness & redundancy, fault tolerance.
- Available technology, no prototypes within prototypes (every thing used are readily available).
- Non site specific.
- Hydraulic power take-off system - powerful, efficient & controllable.
- Non-capital intensive production process, flexible low cost production.

DEMERITS

- Problem of Power transmission to shore.
- Noise production at the site.
- Navigation disruptions are possible.

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CHALLENGES

- Risks during project development
- Risks during construction/installation
- Risks during operation(technical & political)
- Availability of debt
- Project length
- Due diligence costs
- Bankable warranties

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CONCLUSION

- Wave energy is not expensive to operate and maintain, no fuel is needed and no waste is produced. However, it depends on the intensity of the waves and needs a suitable site where waves are consistently strong. The infrastructure must be able to withstand very rough weather.
- Wave power lies not in huge plants but in a combination of on-shore generation and near-shore generation (using a different technology) focused on meeting local or regional needs. If this system prove to be economically possible, only 0.1% of the renewable energy within the world's oceans could supply more than five times the global demand for energy.
- The Pelamis Wave Energy Converter is a revolutionary concept resulting from many years of engineering development. It was the world's first commercial scale machine to generate electrical energy into the grid from offshore wave energy and the first to be used in commercial wave park projects. In Portugal, Pelamis System is now proving to be successful.
- Thus, it can be seen that the Pelamis P-750 is capable of generating power in the area of gigawatts. The average amount of power generated per month is 15GW which can supply power to nearly 10,000 homes. Pelamis is a sustainable technology due to a number of considerations. Since the hydraulic fuel used by the hydraulic joint is biodegradable so even if a Pelamis unit is badly damaged there will be no adverse effects to the environment. This feature of Pelamis meets the environmental needs of sustainable development because it does not harm the environment.

REFERENCES

- www.google.com
- www.wikipedia.org
- www.studymafia.org

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