

**Engineering School**  
**Department of Hydraulic Engineering,**  
**Theory of Buildings and Structures**

# **Methods and technical means for using the energy of waves**

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# Introduction

- In the last 10-15 years, interest in the use of wave energy has increased. In recent years, many different technical projects have appeared. There are about 500 lighthouses and navigational buoys in the world working on the energy produced by wave converters.

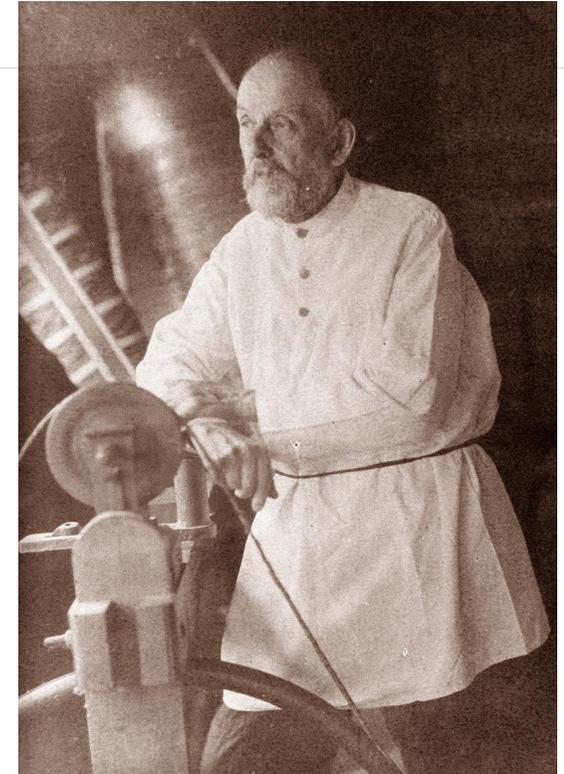
-In Japan over 300 buoys and lighthouses operate on the energy of sea waves.

-In Norway, since 1985, the world's first industrial wave station with a capacity of 850 kW operates.



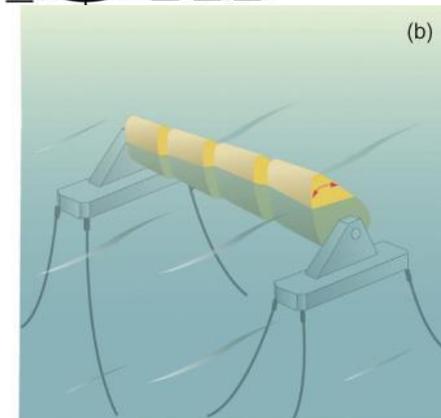
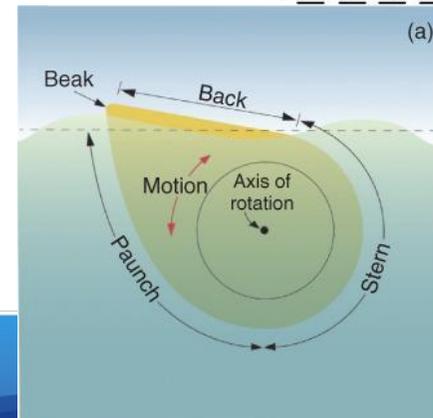
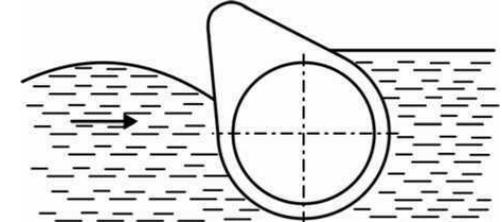
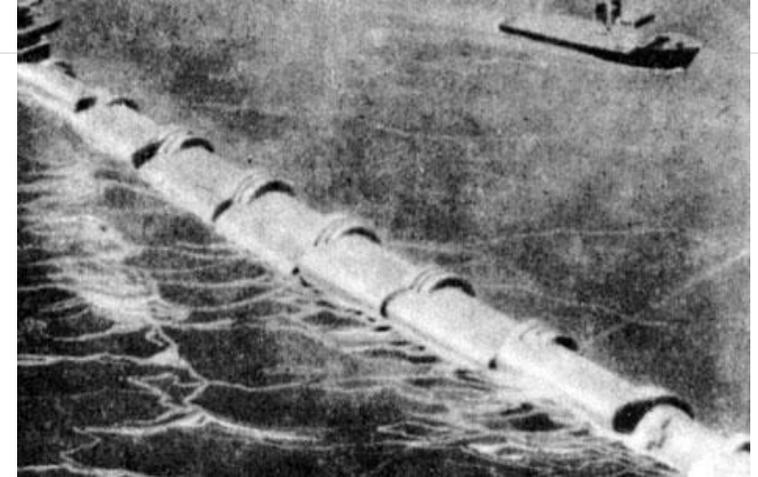
# History

- The idea of obtaining electricity from sea waves was expounded in 1935 by the Soviet scientist K.E. Tsiolkovsky.
- The work of his wave power stations was based on the effect of waves on working bodies, using of floats, pendulums, blades, shells, and so on



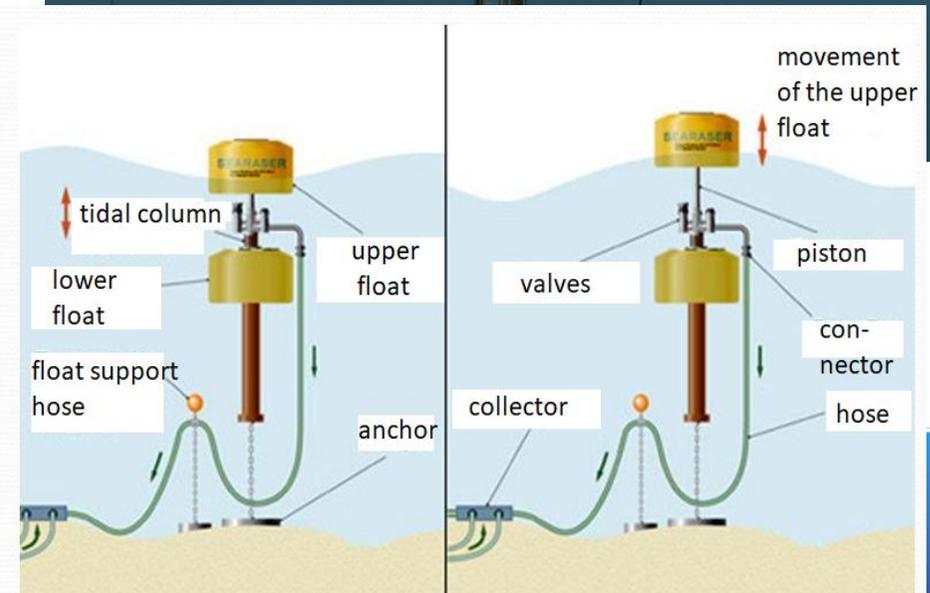
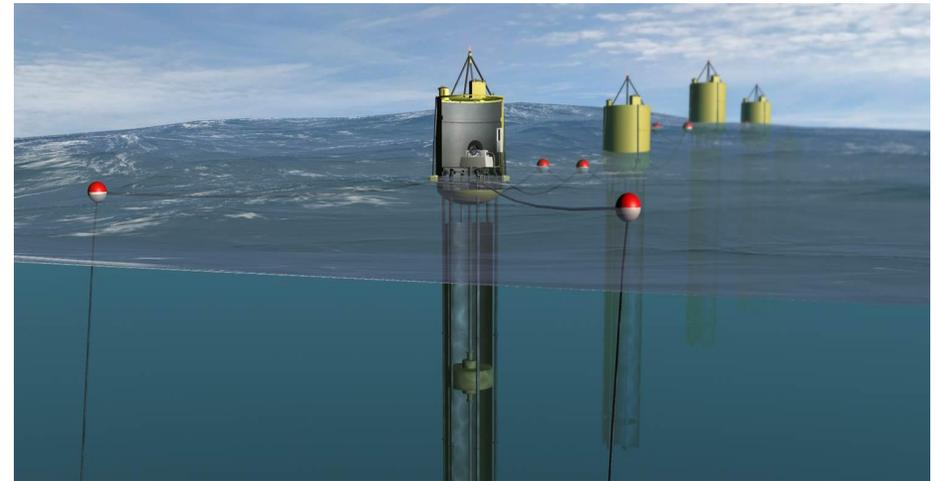
# Duck of Salter

- United Kingdom, 1978
- It is a wave energy converter. The working structure is a float ("duck"), whose profile is calculated according to the laws of hydrodynamics. Under the action of waves, the floats come into motion and return to their original position by the force of their own weight. In this case, pumps are driven by the shaft filled with specially prepared water



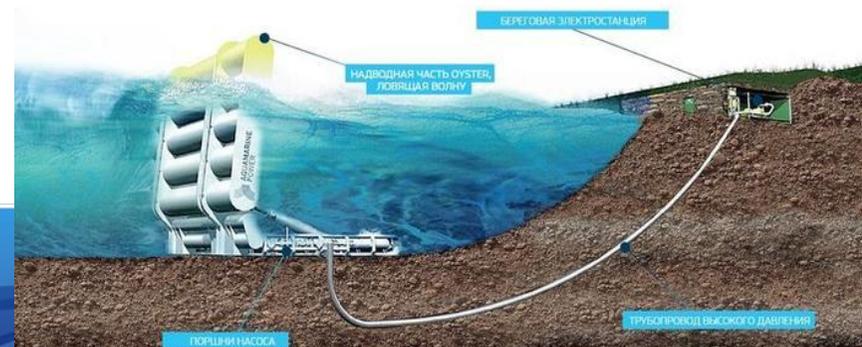
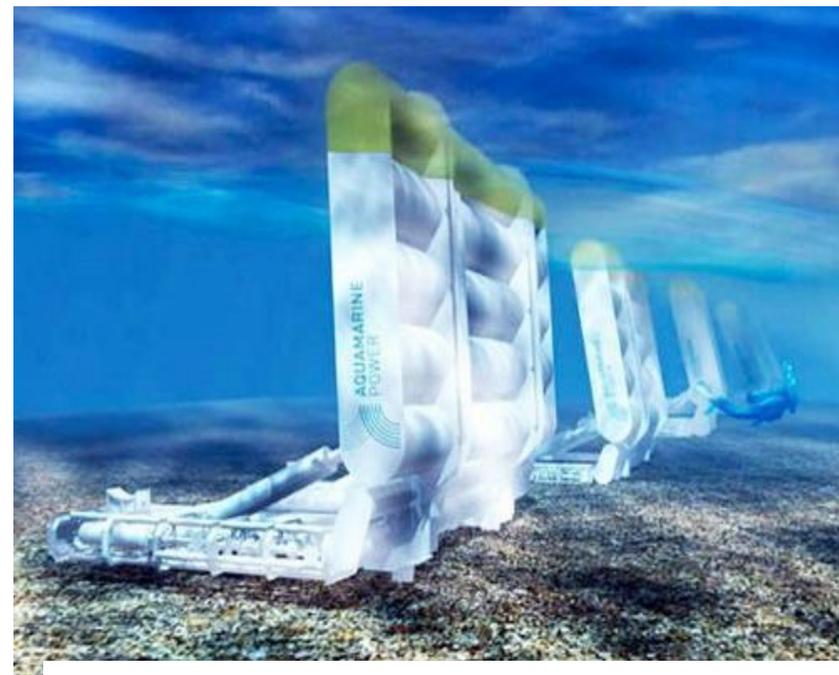
# Wave power converter of float type

- Wave power plant of float type is a closed metal capsule. In the case there is a pendulum. Inside the pendulum housing is fixed three-winding alternator. On the drive shaft generator is located gear wheel, which moves in mesh with rail. When a wave motion creating at the top and bottom points of the passage waves, the pendulum performs reciprocating movements, accumulating potential energy on the spring.



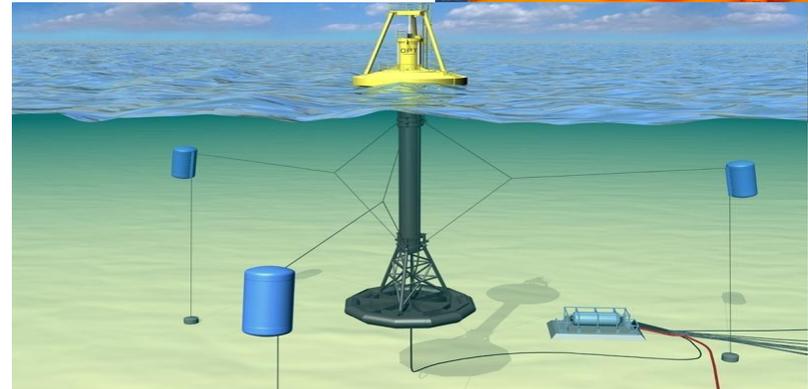
# British "Mollusc"

- United Kingdom
- In this device as working bodies are used soft shells – cameras
- Wave power shifts this cameras, and closed airflow from the chambers to the frame of the installation and back is formed. Wells air turbines with electric generators are installed on the flow path.
- In Scotland, on Lake Loch Ness, an installation consisting of 12 chambers and 8 turbines was tested. The theoretical power of such an installation is up to 1200 kW.



# Buoy-generator

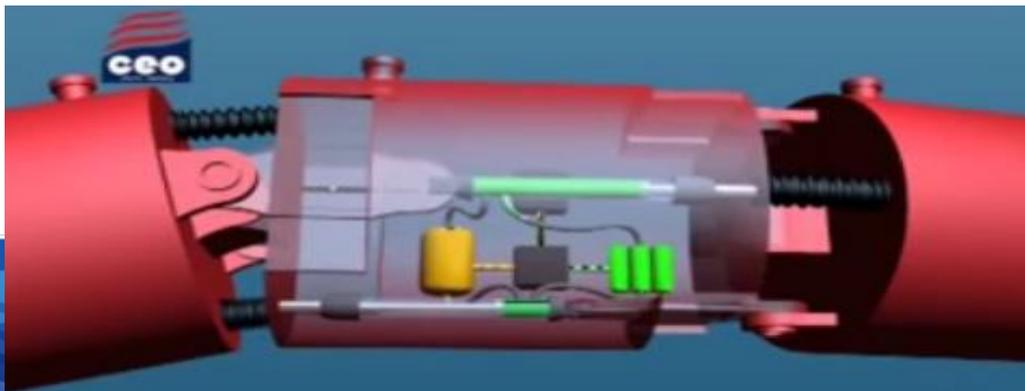
- Scotland
- The buoy is 42 m long, held by an eleven-meter float and an anchor system. The capacity of one station is 150 kW. The float moves vertically in unison with the sea water fluctuation. It is fixed to the movable rod. The rod is part of a linear generator that generates electricity during the passage of the stator winding.





# Wave Power Station Pelamis

- Portugal 2009
- Unusual swinging wave power stations are located just five kilometers from the northern coast of Portugal.
- Pelamis is a semi-submerged structure, which consists of four sections in the form of cylinders, connected by joints.
- The waves cause the floating "snake" to flex. At the junction points, the hydraulic pistons move and pump oil through the hydraulic motors, which, at the same time, force the electric generators to rotate.



# Conclusion

- All this wave converters are alternative sources of energy. Nowadays they are used not often as other energy sources, because they have various disadvantages (such as low power, high cost, the ability to use only in the presence of high waves) but scientists around the world are trying to eliminate all this disadvantages. Every year countries are beginning to use wave energy more and more. And I hope that in the near future, the use of a wave converter will become commonplace.





**THANK YOU FOR ATTENTION !!!**

