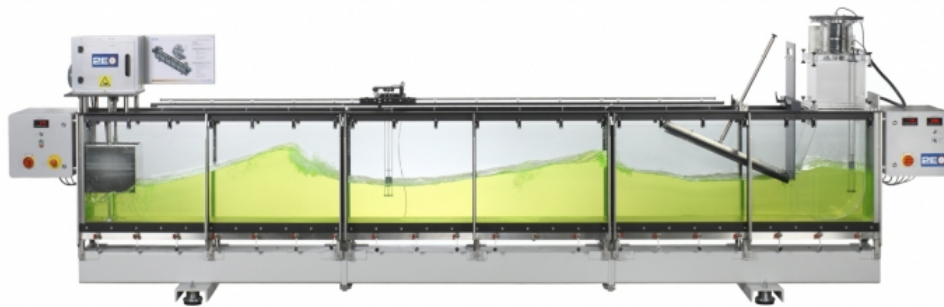


ET 270

Wave energy converter, OWC



Description

- configurable wave generator
- turbine unit with Wells turbine and electric generator
- GUNT software for operation, data acquisition and visualisation of the measurement results

Wave energy converters use the energy from continuous wave movements for the environmentally friendly production of electricity. They can supply electrical energy along the coast, in particular to remote locations. Structurally they are easy to integrate into moles, harbour walls and coastal protection systems.

ET 270 is a laboratory-scale wave energy converter consisting of a wave generator, a wave flume and the OWC wave energy converter with turbine unit.

To generate waves in the wave flume, a displacer is moved up and down by an adjustable crank drive. The height of the waves is varied by changing the lift of the displacer. The speed of the motor sets the frequency of the waves. At the end of the wave flume a baffle plate guides the waves into the wave energy converter.

The OWC wave energy converter consists of a chamber and the turbine unit. The initiated, continuous wave motion produces an oscillating water column (OWC) within the chamber, which causes the air mass above it to move. The air flow generated in this way drives the Wells turbine. Wells turbines work independently of the direction with respect to the inflow: the flow energy is converted during both the upward and downward movement of the air.

A DC motor is connected to the turbine and is used to start the turbine up. Upon reaching a set speed, this then acts as a generator and produces electricity.

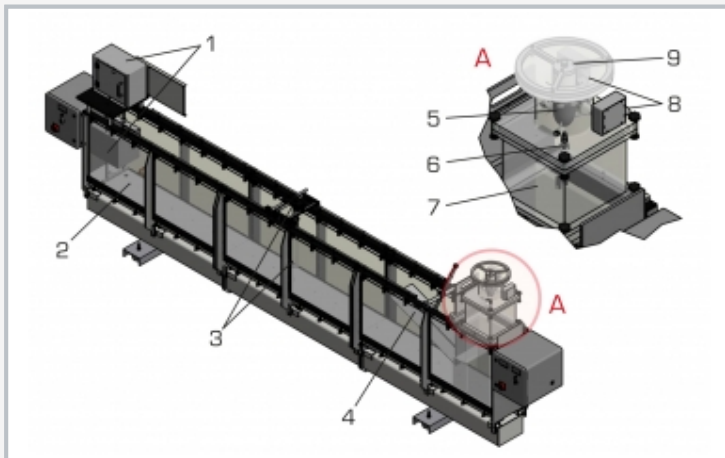
The water level, and thus the wave height, can be measured along the wave flume with a movable ultrasonic sensor. Inside the chamber there is another ultrasonic sensor used to measure the movement of the water column. Pressure measuring points in the turbine housing are used to determine the flow velocity of the air movement. The measured values can be read on digital displays. At the same time, the measured values can also be transmitted directly to a PC via USB. The data acquisition software is included.

Learning objectives/experiments

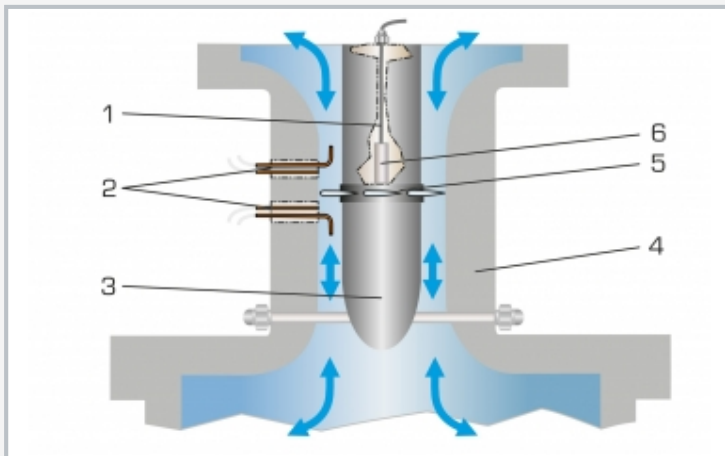
- familiarisation with operating principles of a wave energy converter
- understanding of energy generation from wave motion
- measurement of wave motions
- familiarisation with design and operation of a Wells turbine
- optimisation of operating behaviour

ET 270

Wave energy converter, OWC



1 wave generator with displacer, 2 wave flume, 3 ultrasonic sensor, 4 baffle plate, 5 Wells turbine, 6 measuring device for amplitude of the water column, 7 chamber, 8 sensors for pressure measurement, 9 upper suspension of the turbine



Turbine unit: 1 cable to the switch box, 2 Pitot tubes to determine flow velocity, 3 hub, 4 housing, 5 rotor, 6 generator



Software screenshot

Specification

- [1] wave energy converter consisting of: wave generator, wave flume and wave energy converter
- [2] wave generator with control unit, AC motor with adjustable frequency and adjustable lift of displacer
- [3] wave height measured by ultrasound
- [4] baffle plate for guiding the wave into the chamber
- [5] wave energy converter with oscillating water column, chamber and turbine unit
- [6] turbine unit with rotor and generator
- [7] pressure measuring points to determine the flow velocity in the turbine
- [8] turbine load: DC motor for starting up the turbine, switches to generator for electricity production upon reaching the target speed
- [9] option of manual control of the plant via switch boxes or digital control via the GUNT software
- [10] GUNT software for data acquisition via USB under Windows 7, 8.1, 10

Technical data

Wave generator

- power: 550W
- displacement volume: 26,5L

Wave flume

- LxWxH: 5000x300x600mm

Wells turbine

- power: 0...1000mW
- speed: 0...6000min⁻¹
- rotor: 6 blades
- outer Ø: 120mm, inner Ø: 80mm

Measuring ranges

- frequency: 0...1,83Hz (wave generator)
- wave height: 0...600mm
- level: 0...600mm (chamber)
- flow velocity: 0...26m/s
- speed: 0...6000min⁻¹
- current: ±1000mA

- 230V, 50Hz, 1 phase
- 230V, 60Hz, 1 phase
- 120V, 60Hz, 1 phase
- LxWxH: 5850x700x2050mm
- Weight: approx. 500kg

Required for operation

PC with Windows recommended

Scope of delivery

- 1 experimental plant
- 1 set of accessories
- 1 GUNT software CD + USB cable
- 1 set of instructional material