

Hydraulics Facilities

Faculty of Engineering and the Environment



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Hydraulic Engineering

Research is carried out on

- Generation of renewable energy from rivers and the ocean
- Fundamental fluid mechanics and sediment transport

We approach these topics using field as well as small and large-scale experiments.

Facilities include indoor and outdoor flumes, wave tanks and state of the art measurement technology (LDA, ADV, PIV).

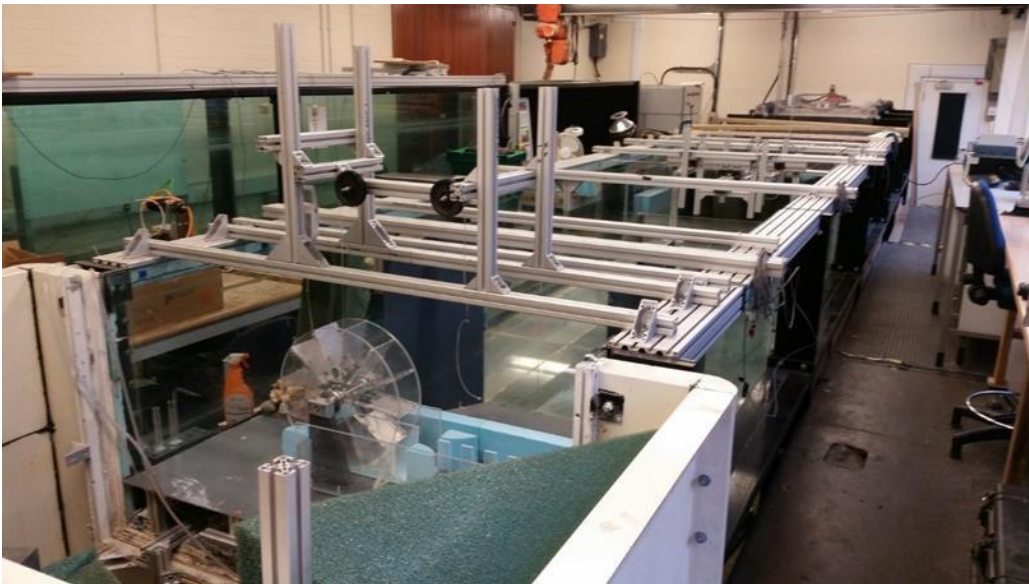
Experimental data are used to refine theoretical and numerical models with the aim of providing effective solutions for engineering problems.



Main campus

At Highfield, we have two laboratories each of 110 m². They contain

- a 0.3 m wide, 0.4 m deep and 12 m long tilting flume
- a 0.4 m wide, 0.4 m deep and 14 m long wave tank
- a 0.5 m wide, 1.2 m deep and 15 m long wave tank with absorbing wave paddle, and
- a general purpose flume of 1.5 m width, 0.6 m depth and 6 m length

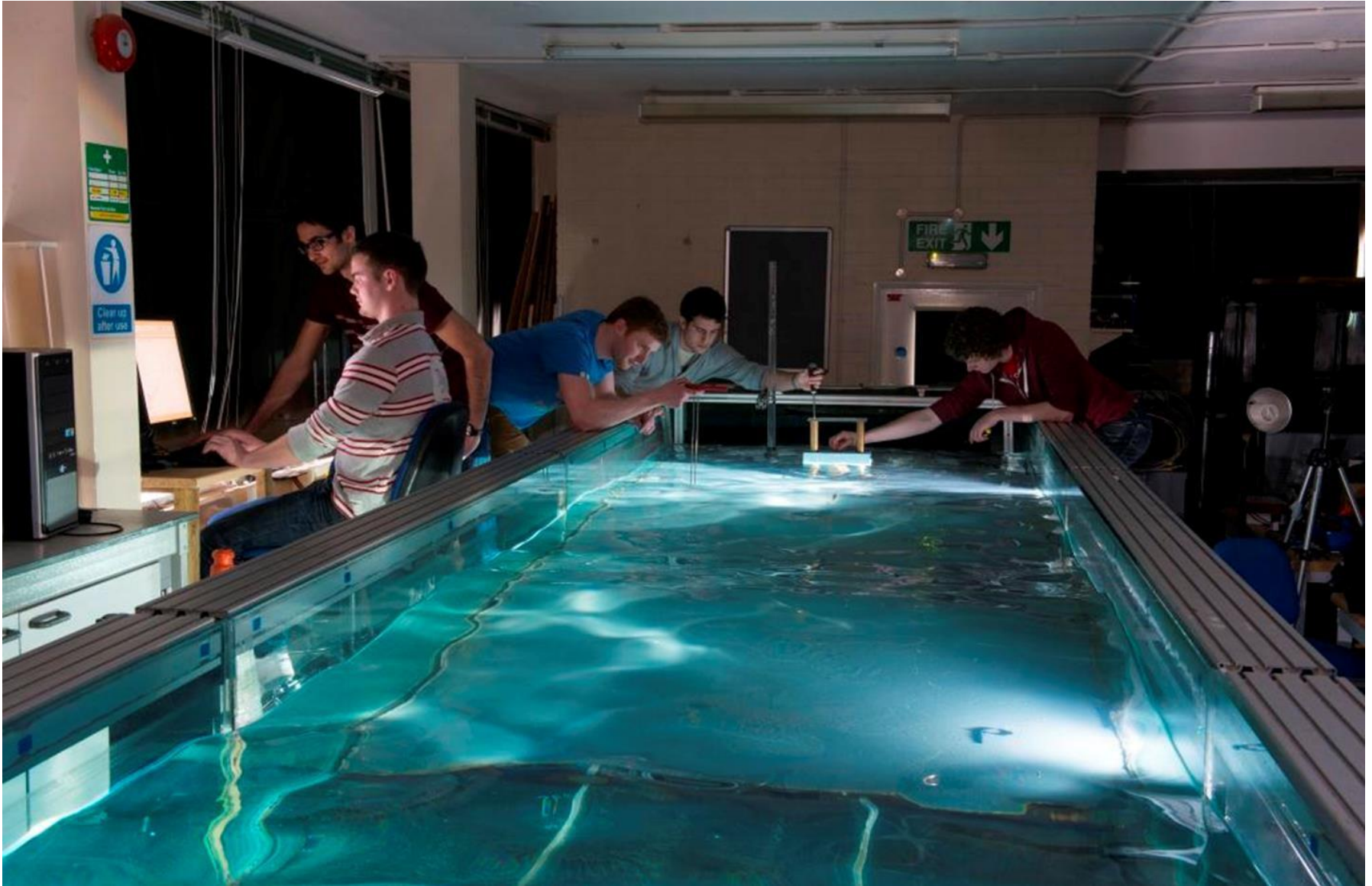


Above: 0.4 m wide wave tank

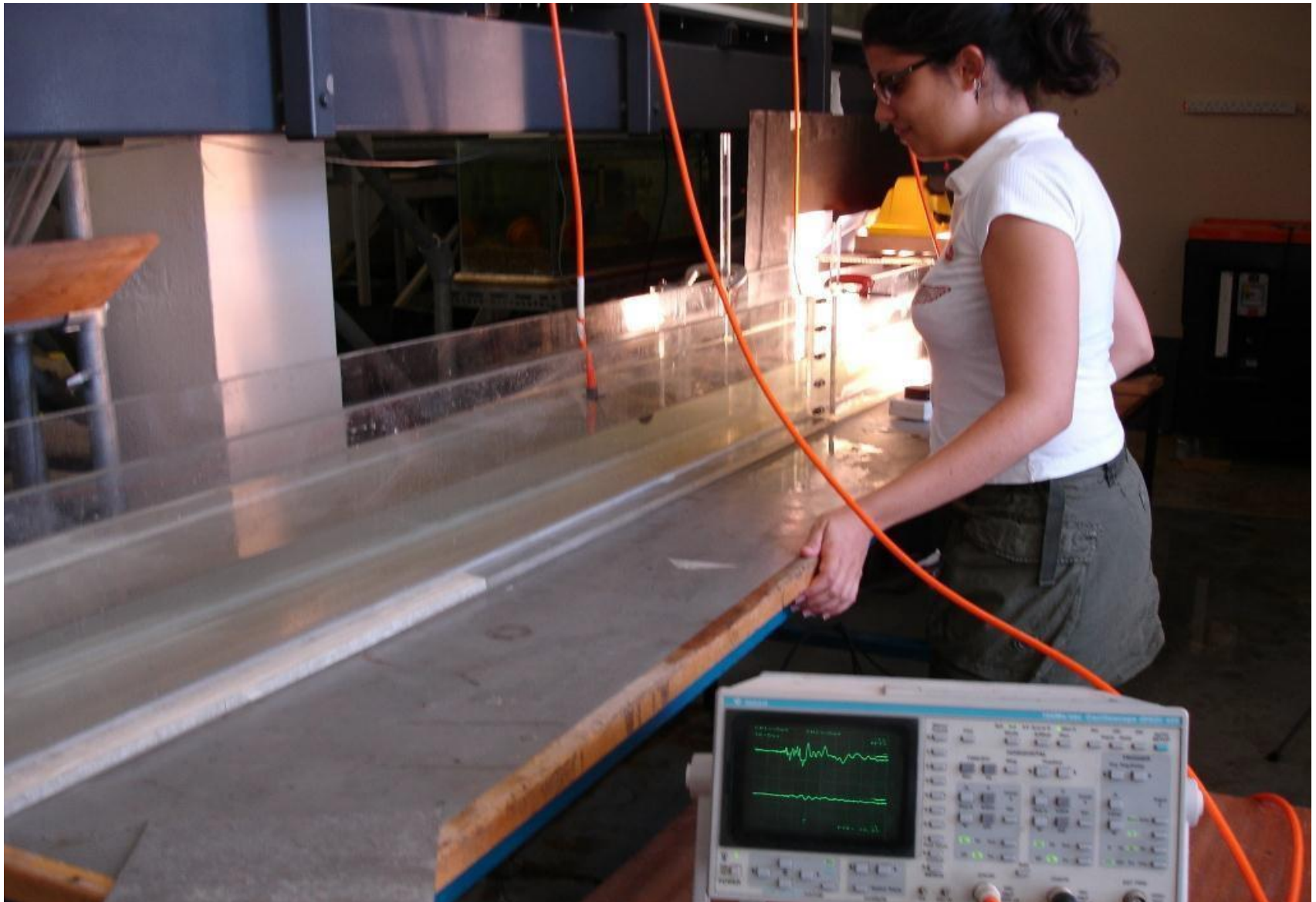
Above left: 16m(l) x 0.6m(w) x 0.8m(d); Tilting 1.5 deg + and 0.5 deg - ; Max flow rate of 430m³/hr

Below left: General purpose flume, 15 m wave tank

Larger-scale wave tank experiments



Smaller-scale wave tank experiments



Smaller-scale tilting flume experiments



Chilworth

At Chilworth Science Park, approx 8 km from the main Campus, we have an additional facility with:

- a 25 m long, 1.4 m wide and 0.6 m deep indoor tilting flume
- a 60 m long outdoor flume with a trapezoidal cross section of 2.1 m width at the base, and 0.5 m depth, max flow $0.8 \text{ m}^3 \text{ s}^{-1}$
- A 60 m x 0.5 x 0.5 m prismatic channel, max flow $0.15 \text{ m}^3 \text{ s}^{-1}$

Large-scale tilting flume



Large-scale tilting flume



Outdoor flume





Above: 60 m channel with natural vegetation and sediment trap

Left: Outdoor flume experiment

Outdoor flume experiment



Prismatic channel



Boldrewood

Our new Hydromechanics building on the Boldrewood campus will house a range of large facilities designed for mixed mode teaching and research.

The towing tank (138 m long x 6 m wide x 3.5 m deep) is equipped with a high-speed carriage and multi-element wave maker: it is the first new tank to be built in the UK for several decades, and the largest university- owned one.

A tilting sediment flume with a working section 0.6 m wide and 16 m long is being installed to complement the facilities at Chilworth. A second water tunnel will be constructed for higher speed flows.

An additional flume coupled with a wind tunnel will also be installed.



Towing tank

Teaching

We have 12 Armfield hydraulics benches on which we run the following experiments in Part 1:

Cavitation demonstration

Osborne Reynolds' experiment

Hydrostatic force

Conservation of Energy
(Bernoulli theorem applied to a venturi section)

Conservation of momentum
(water jet impact)



Some examples of experimental work



Renewable Energy generation
from low-head hydropower.

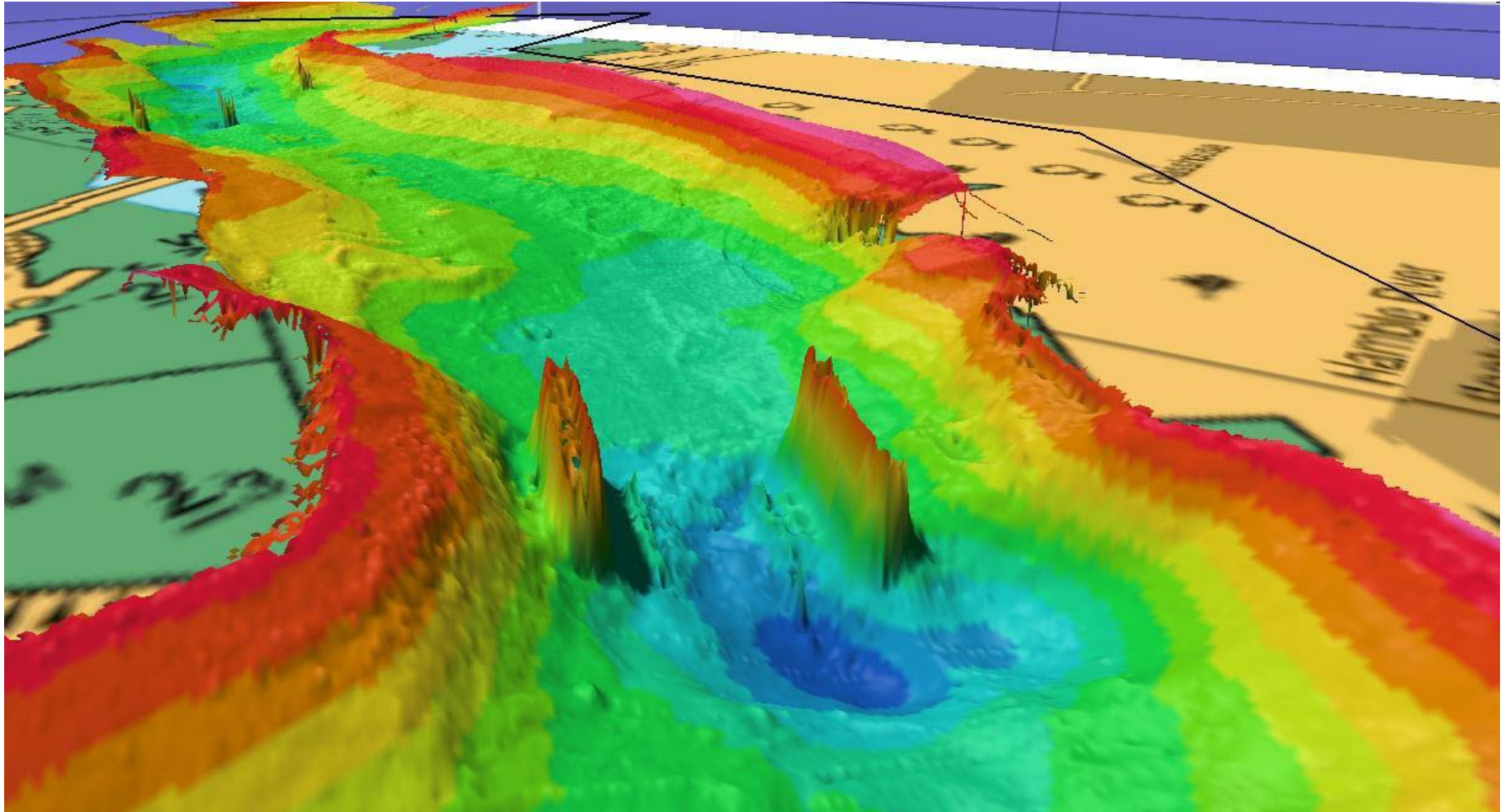
Above: Floating water wheel

Right: Hydrostatic pressure wheel



Wave-induced bed-forms and scour





Multi-beam sonar measurements of River Hamble bathymetry (Hampshire, UK)



Remodelling the hydraulics of the Oakley Beat on the River Test

Experimental raceways in Almeria, Spain





Experimental hydropower Installation

River Iskar, Bulgaria

Power = 10 kW
Head difference =
1.2 m

More information

See also our webpages:

www.water-engineering.soton.ac.uk



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[http://www.southampton.ac.uk/engineering/research/themes/water and environment.page](http://www.southampton.ac.uk/engineering/research/themes/water_and_environment.page)