Research in Marine Hydrodynamics and Marine Hydroacoustics

University of **L**e **H**avre : - **LOMC** - Laboratory of Mechanics, Physics and Acoustics

Marine research team : ≈ 10 researchers + 7 Phd students

www.CRIHAN.fr - **C**entre de **R**essources **I**nformatiques de **Ha**ute **N**ormandie -

Supercomputer IBM Cluster, 8 nodes P 575 Power 5

http://WWW.bassin.fr/

The B600 Towing Tank 545 m for rapid and reliable testing

Wave tank *Roger Brard*

Tunnel of cavitations

LARGE HYDRODYNAMIC TUNNEL (*GTH)*

The future deployment of marine current energy converters raise questions about their impact on the environment.

Modifications of the overall flow patterns in the area of current energy devices may alter the erosion and sediment transport by their wakes effects, and even the free surface of the sea.

So, the LOMC lab proposes to develop :

- numerical tools to help with the environmental impact assessment of future commercial installations.
- experimental tools (LOMC + IFREMER)

(LOMC = LMPG + LAUE)

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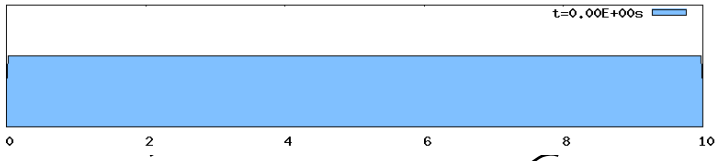
2- Hydrodynamics study of the overall flow patterns : *Impact on the environment*

- Wake effects
- Erosion and sediment transport
- Numerous devices of submerged turbines

Free surface



Blades

Wake generator

Wake ≈ Vortex flow

Seabed

- Experimental : wave and current flume, LDV, PIV
- Numerical : 3D Vortex particle method – Smooth Particle Method

French Research Institute for Exploitation of the Sea

Ifremer

The submerged marine wake bubble has long life duration and is a detectable acoustic signal with a microphone at several hundred meter of the turbine.
Bubbles, which can provoke the deterioration of blade turbine with cavitations phenomenon are also the essential element making up the wake, so :

- The LOMC investigates theoretical and experimental results on the acoustic waves radiated from the submerged turbine.
- Other phenomena as crack or corrosion on the blade may generate vibrations in the structure which can be detected and analyzed by microphones.

With these in-situ measurements, the objective is to improve the reliability of submerged turbines

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1- Reliability of submerged turbine : acoustic scattering of vibrations

Free surface

Blades

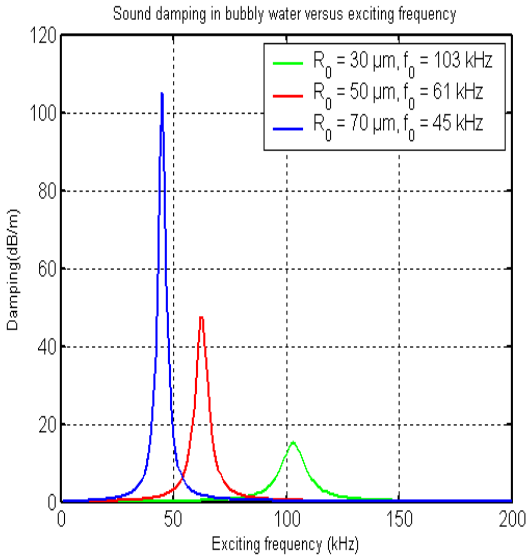
Wake generator

Acoustic waves radiated from the submerged turbine

-Structure Vibrations

-Bubble collapse

Microphones (acoustics noise measurements)



Seabed

- **Experimental studies** : "*French Bassin"* and "*LOMC"* experimental device