

Giovanni Bracco is Assistant Professor at the Department of Mechanical and Aerospace Engineering (DIMEAS) of the Politecnico di Torino in Italy. His research activities focus on the production and management of Marine Renewable Energy such as Wave and Wind Energy.

Giovanni obtained the Master of Science Cum Laude in Mechanical Engineering in 2006 and the PhD in Mechanics in 2010 at the Politecnico di Torino, defending a thesis on ISWEC (Inertial Sea Wave Energy Converter), a system exploiting gyroscopic effects to convert wave energy into electricity.

Its activities in the marine energy field relate to the research and development of Wave Energy Converters (WECs) dedicated to the use in the Mediterranean Sea, such as ISWEC, PEWEC (Pendulum Wave Energy Converter) and point absorbers. The activities involve the definition of non-linear numerical models aimed at evaluating the productivity of a WEC, its survivability and the estimation of the energy cost, duration and environmental impact of the converter. The models are of the type “wave to wire”, able to describe all the subsystems of the WEC and to estimate the electric produced power from the incoming wave field. The models include non-linear 3DOF mechanics and hydrodynamics, quasi-static mooring, and PTO (Power Take Off) efficiency.

Model validation was achieved through the design and execution of experimental campaigns in wave climate controlled basins such as the INSEAN facility in Rome, the Naval Basin at the University Federico II in Naples, the test flume at the Politecnico di Torino and the semicircular wave basin of the University of Edinburgh. The activities are carried out with small-scale models (1:50) for the preliminary assessment of the WEC conversion capacity and medium-scale (1:8-1:12) for the model validation and full-scale predictions.

The experimental activity is also conducted through HIL rigs (Hardware In the Loop), which allow to simulate the activities carried out in the tank testing through the use of experimentally validated mechanical simulators, with a reduction in time and test costs.

As part of the Technology Transfer, he is co-author of two patents on the ISWEC device and is a founding member of the spin-off Wave for Energy, born in 2010 to industrialize and market the ISWEC converter. In 2015 the company in collaboration with the Politecnico di Torino has installed in the island of Pantelleria a ISWEC demonstrator with power rating of 100 kW. The company is currently working together the main Italian players in the energy field to completely industrialize the device.

The R&D activities deriving from the wave power fields have been incorporated in the design of offshore hybrid platforms (wave and wind energy), with emphasis on regenerative platforms with gyroscopic stabilization. The activities on the platforms include the analysis of the sites of interest at European and World level, the definition of specific prototype installation sites, the design and numerical simulation of the platforms, with construction of small-scale models.

Specific activities on the integration of renewable energy sources in isolated micro-grids are carried out on the case study of the island of Pantelleria, defining the technical specifications for the realization of a public transport system using electric buses to replace the current system with Diesel buses together with a model of scenarios of electric private mobility.

Within the activities of the research group, he was involved in the design (dynamic, functional, structural) of test benches for testing of linear and rotary servo actuators for aerospace use and in the management of a HPR platform (Heave, Pitch, Roll) and its use as a flight simulator.

The teaching activities relate to the courses of Mechatronics, Machine Mechanics and Control of Mechanical Systems for a total of about 300 hours of academic instruction. Giovanni has held seminars and courses on wave energy at the KTH (Royal Institute of Technology in Stockholm, Sweden) in 2012 and at MIT (Massachusetts Institute of Technology in Cambridge, USA) in 2016.

Giovani is author of over 40 scientific articles in International Journals and Conferences in the field of Renewable Energy and Applied Mechanics and he has been a speaker at 11 international conferences.