

## Internship at Wavegarden

With the rapid development of computational power, science is making its way through a wide variety of new fields. One of the newest and very promising fields is the sports industry. Wavegarden is dedicated to the surfing industry. They are pioneers in the fabrication and development of wave-pools, and they are located in a village called Aizarnazabal in the north of Spain.

Wave-pools are a very promising new technology for all surf-addicts around the world. Surfing is indeed a complicated sport, as it is highly affected by meteorological conditions. The quality of a surfing session depends highly on the wave quality, which in turn depends on the type of swell coming from the deep sea, the wind, the orography of the coast, which in some cases can change considerably depending on the currents and wave energy, and some other parameters. Wave pools however, can provide quality surfing sessions everyday all over the year. Thus, their potential as training zones for surfers or learning zones for beginners is huge. Therefore, it is not surprising the attention they are arousing in the big surfing community. As wave pools are a merging technology, improvements and research are continuously being done.



Figure 1: Wave-pool URBNSURF in Melbourne, Australia using the Wavegarden technology.  
Source: <https://urbnsurf.com>



Figure 2: Closer look at the waves URBNSURF in Melbourne, Australia. The Wavegarden technology can produce waves of different shapes accommodated to the client. Source: <https://urbnsurf.com>

The staff at Wavegarden is multicultural and multidisciplinary. There are computational fluid dynamics engineers (CFD engineers) , civil engineers, architects, administrators, shellers, and marketing staff. Some of them come from Australia, England and from different regions of all over Spain. In my case as a physicist with some basic computational background, I worked in the CFD department of the company. A key stage of the development of wave-pools is the computational modeling. Any change in the orography of the pool or in the movement of the components of the

machine needs to be tested with simulation beforehand. This is done by the Computational Fluid Dynamics department of Wavegarden, where I was doing the internship.

My internship lasted a month as it was interrupted due to the COVID-19 pandemic. Nevertheless, the experience was overall very edifying. The team was composed by three engineers and myself. Although when I entered the company the workload of my colleagues was very high, they welcomed me and taught me continuously. Something that I think was very valuable is that they let me propose ideas and try them on my own, i.e. they left room to my inventiveness, which I think is key to do good research for science as well as for industry.

During my internship I learned to build 2D models of the orography of the pool and also run smooth particle hydrodynamic simulations with different programs. Some simple examples of the simulations are shown below.

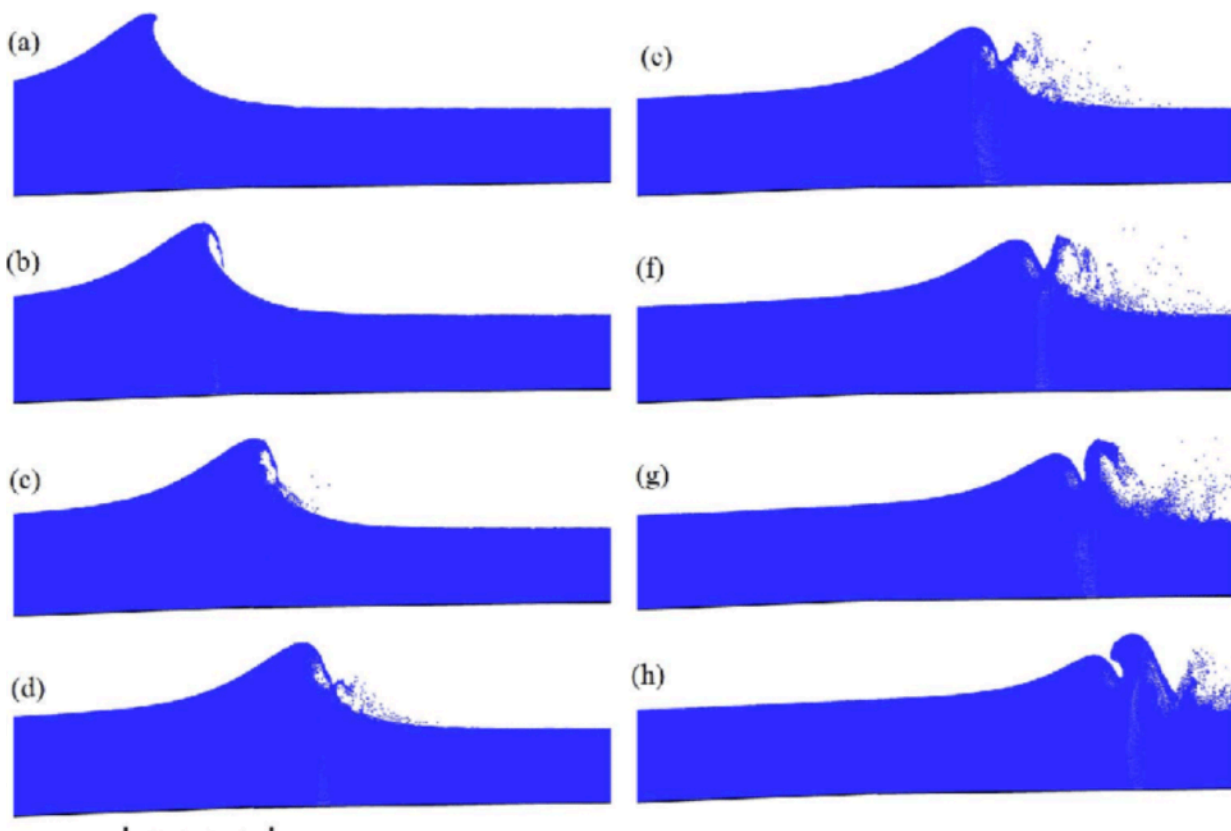


Figure 3: Simple 2 dimensional simulation of the development of a wave after its production using a SPH code.

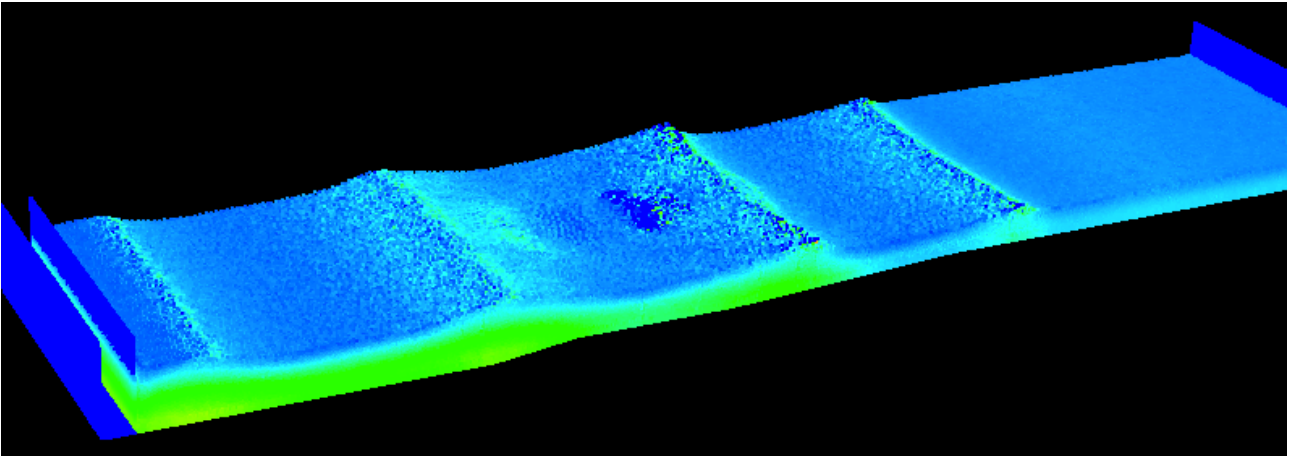


Figure 4: 3 dimensional simulation of the development of a wave after its production with a shock front using a SPH code.

Comparing the working spirit of the company with my previous experience of internships in research groups at research centers, I feel there are some differences. It seems to me that the stress and the demands on the interns were higher in Wavegarden than in my previous experiences. The learning curve was steeper, which also means that I learned much in little time, the effort I had to do however was also higher. Nevertheless, my team leader and my colleagues were able to support me whenever I found difficulties.

In general, I think the experience has been very rewarding. I have learned many new technical abilities but also I have had an insight in the working spirit and method of a company with an international projection. I believe that such an experience during the bachelor or master can be very valuable to anyone, and can clear many doubts regarding the working market that students typically have. Thus, I recommend all students to try and carry out an internship during their studies.