Case Study

"ANSYS tools, obtained through the ANSYS Startup Program, allowed us to achieve one single simulation environment in which hydrodynamic analyses, CFD and structural FEM could be deployed to speed up the SeaTwirl developing process."

Martin Rosander

Sr. Structural Engineer

SeaTwirl AB

ANSYS Case Study

SeaTwirl — The Future of Offshore Floating Wind Turbines

Introduction

SeaTwirl AB is a Swedish SME established in 2012. Since December 2016, the company is listed on the NASDAQ First North Stockholm under the STW sticker. SeaTwirl develops and sells innovative, vertical-axis floating offshore wind turbines. They are easier to install, operate and maintain, and offer a better levelized cost of energy (LCOE) versus other turbines. SeaTwirl has a clear vision: to be the industry-leading, floating offshore wind company by 2030.

Challenges

Overall SeaTwirl challenge:

- CO2 ceiling of 2 percent to limit global climate change. We wish to play an active role in limiting global warming.
- Clean, cheap energy. SeaTwirl believes that clean energy at a reasonable cost is crucial for our society to prosper. We have set out to deliver just that.

The SeaTwirl floating offshore wind turbine features a spar buoy supporting a vertical axis wind turbine. SeaTwirl is currently designing a commercial size demo of 1 MW to be installed at a test site in 2020. It is very important for us to be able to simulate different load cases for our designs to validate our technology for future investors, third-party verifications, regulators, insurance purposes and, ultimately, for receiving necessary certificates.

Technology Used

ANSYS Fluent
ANSYS Aqwa
ANSYS Mechanical

Engineering Solution

We were able to make important development decisions regarding our design. We actively investigated technical, as well as commercial aspects, based on the simulation results.

We used ANSYS software to design and analyze:

- Turbines: With Fluent and Mechanical, we evaluated and optimized the blades and attachment of the struts through extensive 3D computational fluid dynamics (CFD) and structural analyses. ACT helped to develop the layup of the turbine.
- Mooring system: We used Aqwa to evaluate and optimize motion, forces and mooring system properties of the floating structure.
- Entire structure: We used Mechanical to evaluate the structural properties of different components related to the design.

Benefits

- Increased analysis capacity, with the CFD and finite element method (FEM) solvers.
- Increased reliability of results using proven and well-known/well-reputed software.
- Potential for further optimization and weight reduction in future designs once the first demo 1 MW turbine has been through the “complete” analyses.
- Scalability. Once the setup of this turbine is ready, we will be able to easily scale the design for turbines of different sizes.
- Simplified third-party review process, which also raises the market capitalization and promotes investment.

Company Description

Figure 1: S1 30 kW working prototype

The heart of the SeaTwirl concept is our vertical-axis wind turbine design, featuring a tower connected to a spar hull with fixed ballast to increase stability. The turbine, tower and underwater part rotate as one unit, whereas the generator housing is moored to the seabed and keeps the rotating unit in position.

The SeaTwirl design receives a lot of interest in the offshore wind community and has also won prices. We are very proud that Jens Tommerup, the former CEO of MHI Vestas, recently joined our board of directors.

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