

OFFSHORE WIND ENERGY

In the last Vuyk Today, the various activities of Vuyk Engineering Rotterdam in renewable energy and environmental design projects were presented. In this issue, the renewable energy update focuses on offshore wind energy.

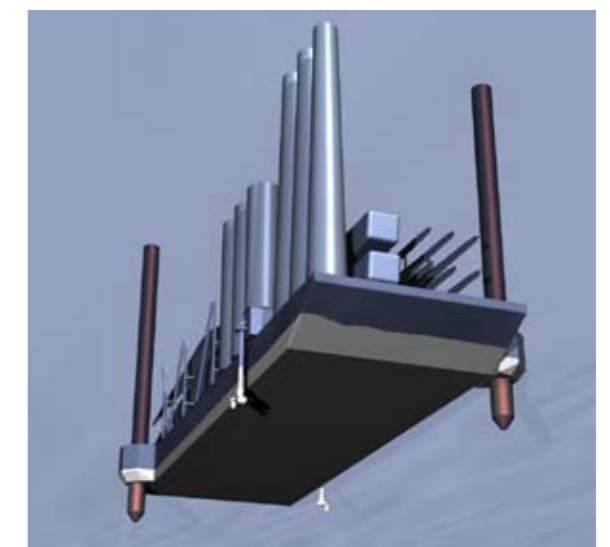
Especially the Western European countries have devoted themselves to supplying a large percentage of the required energy demand from sustainable resources, of which wind is the most developed. Onshore sites have become scarce in some of the countries, and other suitable sites are far away from locations with a large energy demand. Furthermore, an increasing number of people do not like the sight or sound of wind turbines. These and other factors result in fast growth of the offshore wind energy market.

Vuyk Engineering Rotterdam is active in both the discussion about increasing the effectiveness of current installation methods and about future installation methods, for which changes to the turbine design may be considered. These studies are performed together with clients and/or sister companies.

Short term solutions

At the moment, most turbines are transported and installed in a number of parts: a tower in one or more sections, a nacelle, a hub and blades. The hub may be prefitted to the nacelle, and one to three blades may be preinstalled on the hub. The advantage of this method is that more turbines can be transported at the same time. The disadvantages are that the installation offshore takes more time and is relatively weather sensitive, especially the installation of the blades or rotor.

The turbines are transported to the offshore park either by the installation vessel or by a feeder vessel. Usually, an extra transport is required from the factory to a site close to the offshore park, especially if the installation vessel is used for transport. We are studying the feasibility of changing the common heavy transport barge used for the first transport into a feeder barge capable of delivering the turbines directly to the installation vessel. For this, we are studying whether a spud system will reduce the barge's motions enough that it will not require a jack-up system to transfer the parts to the installation vessel. Although the barge would still be towed by a tug, dismountable thrusters could be used for positioning in the field.



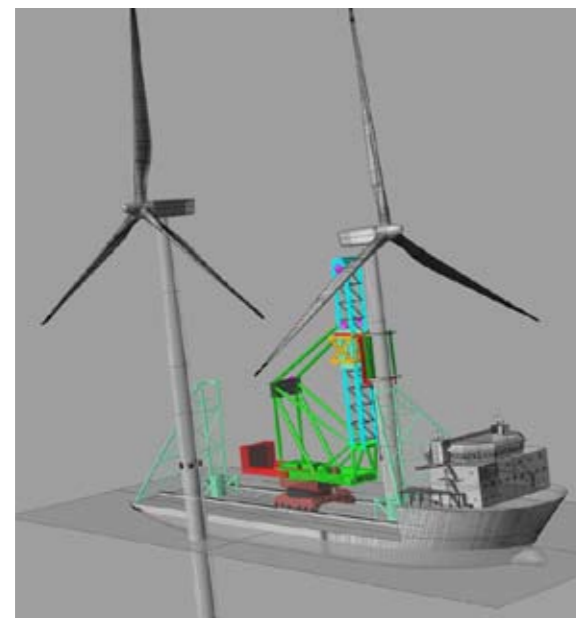
Standard offshore barge with dismountable spuds and thrusters serving as feeder

Mid to long term solutions

Floating installation vessel, a crazy idea? Most people agree that it would be an advantage to be able to install a complete turbine in one lift. Thereby the assembly of a complete turbine could be done onshore instead of offshore.

Currently all turbine installation vessels are jack-ups. However, these have limitations on the wave conditions in which they can get to a jacked position. When comparing these conditions to the wave conditions in which monohull crane vessels can install offshore installations, the difference is not large.

Along with cooperating in the design of a jack-up vessel, we are studying the feasibility of using a floating vessel for installation of a complete turbine. Such a vessel would use specially designed motion-compensated cranes or handling systems. The first results, based on a common monohull, are already promising. From discussions with various clients, such as contractors and turbine manufacturers, there is a great deal of interest in such a solution.



Heavy transport vessel with dedicated installation equipment

The installation chain

Meanwhile, parks are continuing to be built using current methods. Vuyk Engineering Rotterdam is also exploring ways to do this more effectively without a change to the turbine design. Most of the companies involved in offshore wind are looking at the installation vessel only. Recently built vessels have increased in size to be capable of transporting ten or more turbines in one trip. However, looking exclusively at turbine assembly offshore may not be enough when considering an effective method for developing an offshore park. Instead, we are interested in looking at the complete assembly chain: from the manufacturing location to the offshore wind park.

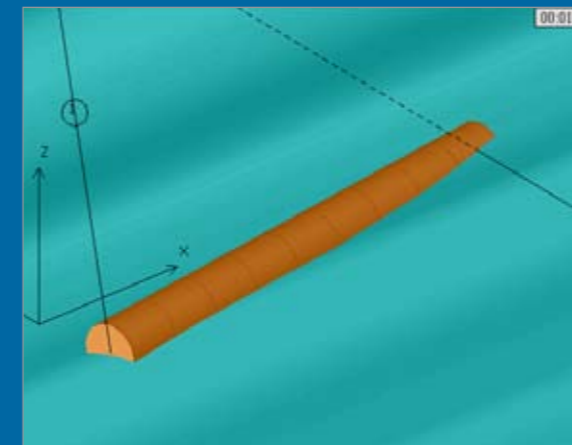
In line with this study, we are considering the logistics and costs of the alternative of using a relatively small jack-up vessel in the field and designing a big feeder to supply the installation jack-up with turbines. Although this alternative involves more vessels, it could result in a more continuous installation of the wind park. Moreover, the transport vessel will not require a crane if a land crane is used for loading.



A2SEA's SEA ENERGY "feeding" the SEA-WORKER

Foundations

The above considerations do not only apply to turbines, but also apply to foundations. Vuyk Engineering Rotterdam is active in projects for foundation installation for various clients and is also looking at alternative methods of installation and/or optimizing the current ones. Studies currently being undertaken include the behaviour of monopiles under tow and during upending, which is a method that is already being used. The study not only considers the motion and load calculations but also the procedures for upending. Furthermore, a study into tow and upending of jacket structures is planned.



Monopile during upending in time domain simulation

Maintenance

Vuyk Engineering Rotterdam is working as a consultant in two projects for the design of maintenance jack-ups. With more and more wind turbine parks being built, a market for maintenance vessels is developing fast.

