TU Delft

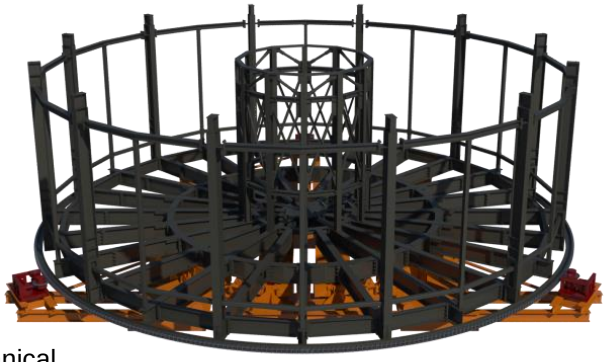
Offshore & Dredging Engineering

Technische Universiteit Delft

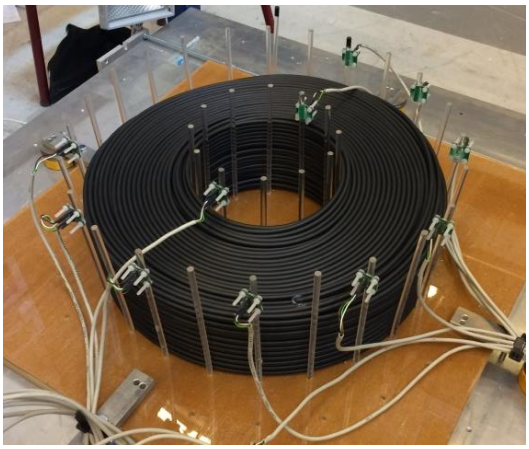
Mechanical behaviour of cable in an offshore turntable

The offshore wind market is growing rapidly and will take a significant share in the total energy supply. Offshore wind energy is usually generated by large wind turbines. To transport the generated energy to transformer platforms or the mainland large sub-sea power cables are used. These cables are installed by means of a cable installation vessel. One of the possibilities to store power cable on board is by using a turntable. This is a large type of equipment consisting of a foundation and basket. Ship motions create accelerations giving an extra dynamic force on the turntable. The current turntable, which can have a cable storage capacity in the range between several hundred tons and 10,000 tons, is designed to be applicable on all kind of vessels and for all kind of weather conditions. Also the influence of cable loads on the turntable is not well known. Due to this rough approximations are made, resulting in a conservative design.

A better understanding of the cable loads will give an optimised design. This will effect in savings on material (and thus weight), assembly time and also the amount of shipping containers used to transport the modular turntables worldwide. The objective of this research is to investigate the mechanical behaviour of the cable in the turntable to obtain better design loads for the turntable whilst maintaining safety levels.



An experimental and analytical approach is used to obtain a better understanding of the mechanical behaviour. A scale model is built to gain knowledge about the physical behaviour of cable, obtain a distribution of forces on the basket walls and obtain hands-on experience. The experiments can also be used to improve and validate theoretical models.



Three experiments were performed: static wall deflection test, acceleration test and the (in)-stability test. The wall deflection test is used to determine the static deflection of the walls due to the cable. The acceleration test is used to determine the dynamic influence of the cable loads on the walls. The (in)-stability test is done to show a relation between the acceleration and stability of the cable package.

The experiments are performed with two types of inner wall: stiff and elastic. The two inner wall configurations are combined with three (elastic) outer wall configurations: a complete, half or no outer wall. From these experiments a new distribution of cable load between the inner and outer wall is found. This result can be used for new, optimised turntable designs.

Student
Gerwin Rutgers
November 7th, 2016

Sponsor
KCI The Engineers B.V.

Thesis committee
Prof.dr. A. Metrikine
Ir. J.S. Hoving
Dr. F. Pisanó
Ir. S. Sanchez Gomez
Ir. K.B. van Gelder