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CULTIVATING MUSSELS IN THE BELGIAN NORTH SEA

Introduction: A currently on-going research to examine the feasibility of growing mussels off the coast was initiated within the project named Edulis. Two experimental test setups were installed in the Belgian North Sea within the wind power park areas of C-Power and Belwind. The partners of Edulis project are: ILVO, UGent, OD Nature, C-Power, Belwind, DEME, Sioen Industries, Colruyt Group, Brevisco and Lobster Fish. In this collaboration, Maritime Technology Division of Ghent University takes part in the numerical modelling of the mussel line system. As a result of the project, various possible scenarios of mussel line configuration will be proposed along with the optimized park layout.

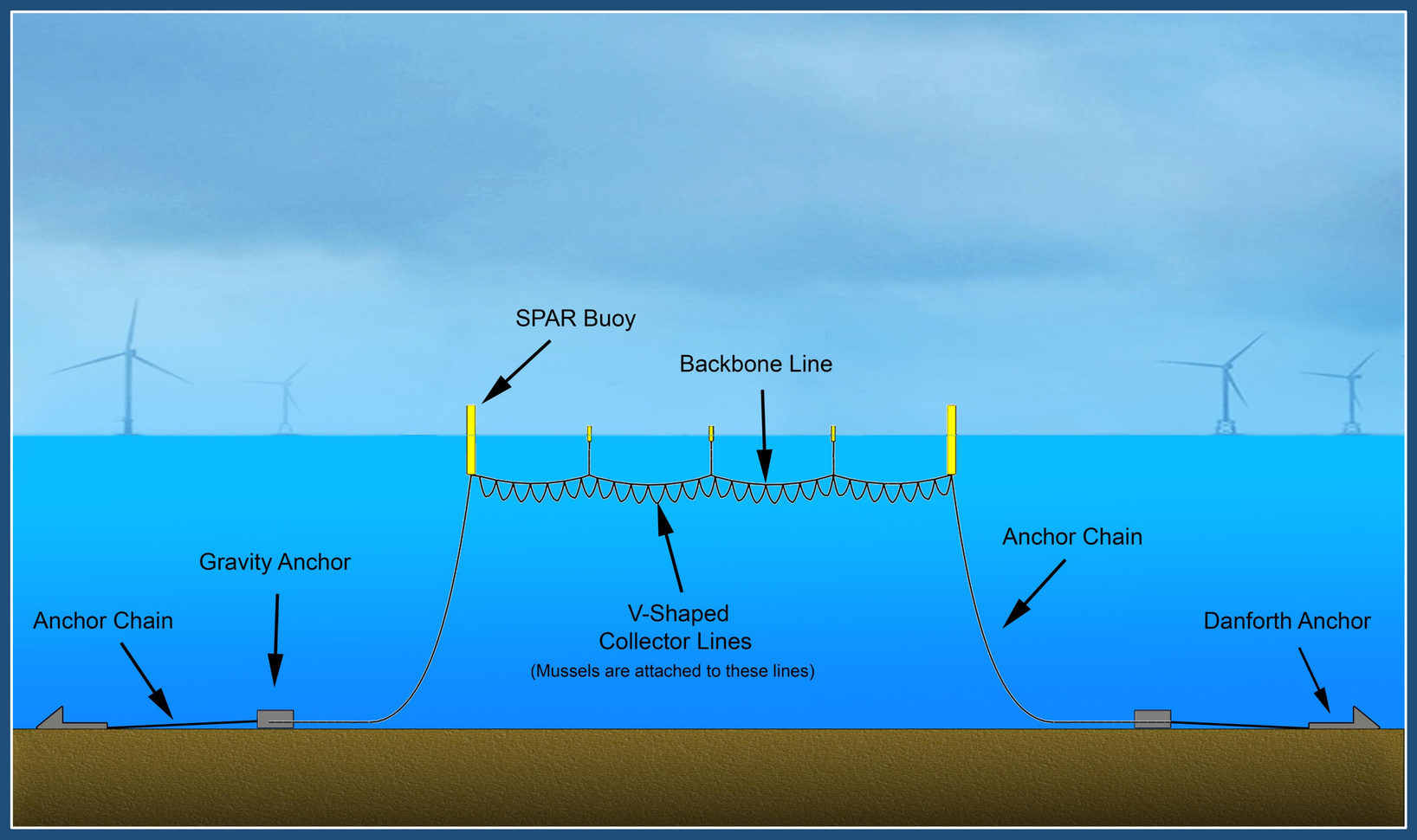


Illustration of a semi submerged longline system that is considered for the study. The floating system consists of a long backbone line, several buoys along the backbone and collector lines to which mussels are attached. At each side, a SPAR buoy is connected to a gravity anchor with a chain. Another chain connects a gravity anchor to a Danforth anchor (length not drawn to scale).

Experimental test setups

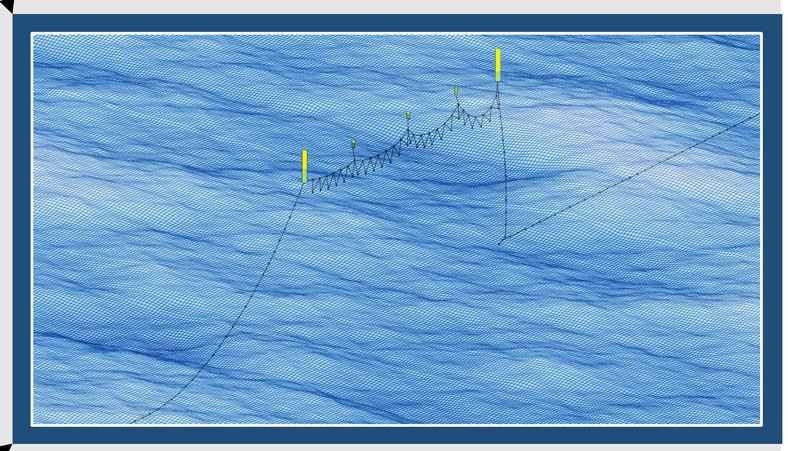
In May 2017, the Bio line was installed in the area of C-Power park. It focuses on the study of the growth of mussels. Seeds were attached to various types of mussel collectors and have grown into mussels, which were harvested in November 2017 (picture above).

Force line was later installed in November 2017 within the Belwind park. It is equipped with measuring devices for the purpose of almost real time data gathering.

Numerical model

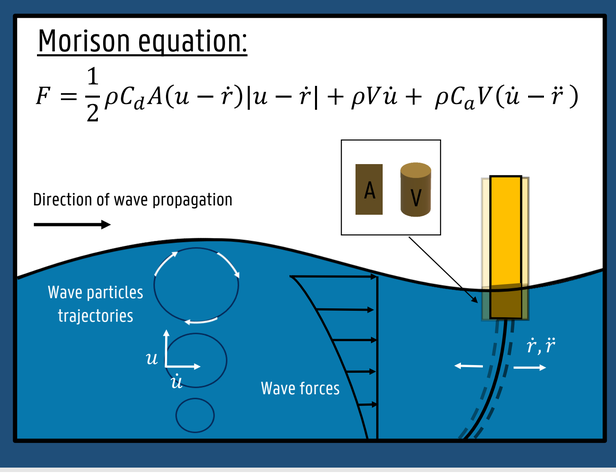
An open source code written by Matthew Hall, namely MoorDyn, was used as a starting point to develop a software that is able to predict the behaviour of mussel line systems under the effect of environmental loads such as waves and currents. A simple lumped-mass approach is used to model the mooring lines, which divides a line into N number of segments with N+1 number of nodes.

Forces and weight properties of each segment are equally transferred to its extremity nodes. The system reacts to the current, wave induced velocities and accelerations by taking into account hydrodynamic forces calculated using the Morison Equation.

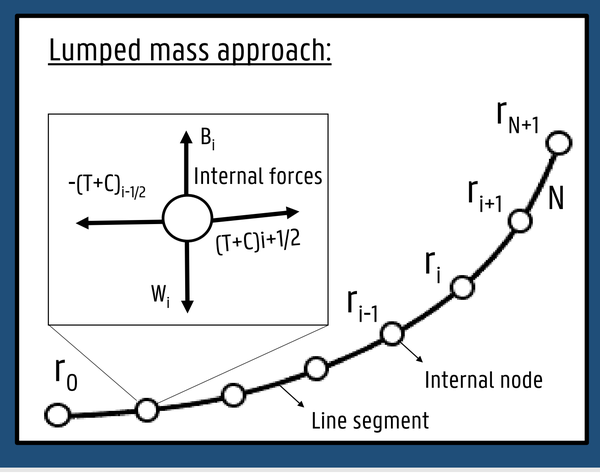


Morison equation:

$$F = \frac{1}{2}\rho C_d A(u - \dot{r})|u - \dot{r}| + \rho V\dot{u} + \rho C_a V(\dot{u} - \ddot{r})$$



Lumped mass approach:



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