

OMDYN2

Dynamic umbilicals for systems floating marine renewable energy

DURATION: 48 months (2018–2021)

CONTEXT

Dynamic power cables have been clearly identified as critical components for floating MRE systems. High-voltage alternating current (HVAC) cables for floating wind turbines are the main concern at this stage. **One of the challenges for the French industry is to identify the need to build or adapt a test bench capable of realistically replicating the combined mechanical, thermal and electrical stresses.**

OBJECTIVE

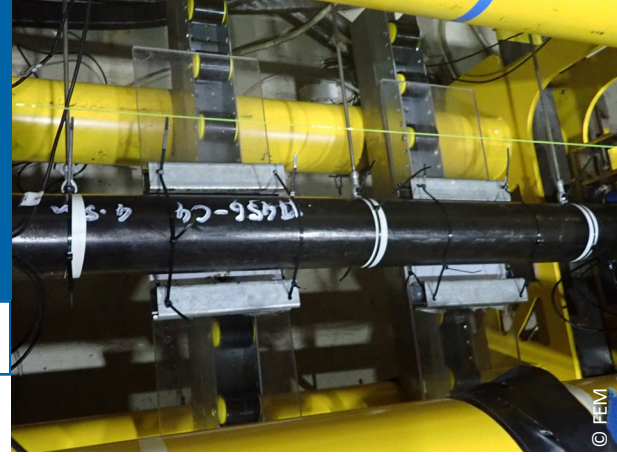
To experimentally characterise and then model the multiphysical stresses experienced by dynamic cables and propose a methodology for in-service monitoring

MAIN ACHIEVEMENTS

- Characterisation of the mechanical behaviour of a dynamic cable as a function of heating
- Development of a local analytical model of a cable section and definition of global parameters for overall models
- Implementation and calibration of a volumetric finite element model and modelling of inter-component friction
- Conducting innovative full-scale tank tests on a cable colonised by mussels produced via 3D printing
- Proof of concept for curvature measurements using optical fibre communication; identification of the conditions for measuring internal stresses via optical fibre

CONCLUSION

OMDYN2 has helped to clarify the complexity of a multi-material dynamic cable under multi-physical stresses. Initial numerical models calibrated against test data have provided a better understanding of these interactions. Fatigue calculations for armour and conductors are now relatively reliable, but further investigations are needed into the service life of conductors and insulators. Unprecedented and realistic hydrodynamic tests on mussel colonisation indicate stresses higher than those described in the literature. Promising avenues for in-service monitoring using fibre optics have also been identified.



TECHNOLOGIES



STAGES OF THE VALUE CHAIN



RESOURCES GENERATED

- **Database** of the bending stiffness of a dynamic cable as a function of temperature
- **2D software** for cross-section design enabling the calculation of fatigue in copper armour and components
- **Automatic meshing module** with a graphical user interface and definition of a **3D finite element model** of a dynamic cable: translation of material properties, periodicity criteria, creation of boundary conditions
- Unique **database** of hydrodynamic forces representative of mussel colonisation
- **Laboratory tests and recommendations** for measuring curvature using optical fibre communication: measurable range depending on the interrogation distance

PARTNERS



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