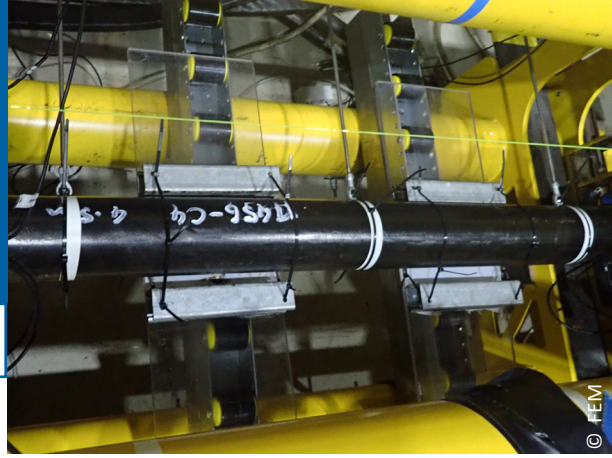
OMDYN2

Dynamic umbilicals for floating marine renewable energies technologies

DURATION: 48 months (2018-2021) | **BUDGET:** €2,143K



CONTEXT

Dynamic power cables have been clearly identified as critical components for floating ORE systems. High voltage alternative current cables, known as HVAC, 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 that would account for the inherent coupling between the mechanical, electrical and thermal stresses involved.**

TECHNOLOGIES

STAGES OF THE VALUE CHAIN

Design

O&M

OBJECTIVE

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

MAIN ACHIEVEMENTS

- Characterisation of the mechanical behaviour of a dynamic cable as a function of temperature rise
- Development of a local analytical cable section model and definition of global parameters for ensemble models
- Implementation and calibration of a finite element volume model and inter-component friction model
- Realisation of innovative tank tests at scale 1 of a cable colonized by mussels obtained by 3D printing
- Proof of feasibility of curvature measurements using optical communication fibre, identification of conditions for measuring internal stresses by optical fibre

OUTPUT RESOURCES

- **Database** of bending stiffness of a dynamic cable as a function of temperature
- **2D cross-section design software** for fatigue calculation in copper armour and components
- **Automatic meshing module** with graphical interface and definition of a 3D finite element dynamic cable **model**: translation of material properties, periodicity criteria, creation of boundary conditions
- **Unique database** of hydrodynamic efforts representative of mussel colonisation
- **Laboratory tests** identifying suitable optical measurement processes and measurable curvature ranges and interrogation distances

CONCLUSION

OMDYN2 has made it possible to clarify the complexity of a dynamic multi-material cable under multiphysical stresses. Initial numerical models calibrated on tests have provided a better understanding of these interactions. The calculation of fatigue in armouring and conductors is now relatively reliable, but there is still work to be done on the life of conductors and insulators. The novel and realistic hydrodynamic tests of mussel colonisation indicate higher stresses than those described in the literature. Promising avenues for in-service fibre optic monitoring have also been identified.

PARTNERS

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