A novel mooring tether for highly-dynamic offshore applications: Durability in the marine environment

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Work stream: Reliability

Introduction

In a highly dynamic wave environment **extreme loads** and **fatigue loads** present significant reliability challenges for floating marine energy devices. The University of Exeter is developing a **novel mooring tether** to mitigate against these mooring loads. In addition, the tether decouples the breaking load and stiffness properties of the mooring, allowing these to be specified independently for a specific device and location [1].

The anticipated reduction in loads will lead to improved system reliability, however, introducing a novel component creates its own reliability considerations. This poster will introduce how the reliability of the Exeter Tether is being addressed and present some early results from testing.

The Exeter Tether

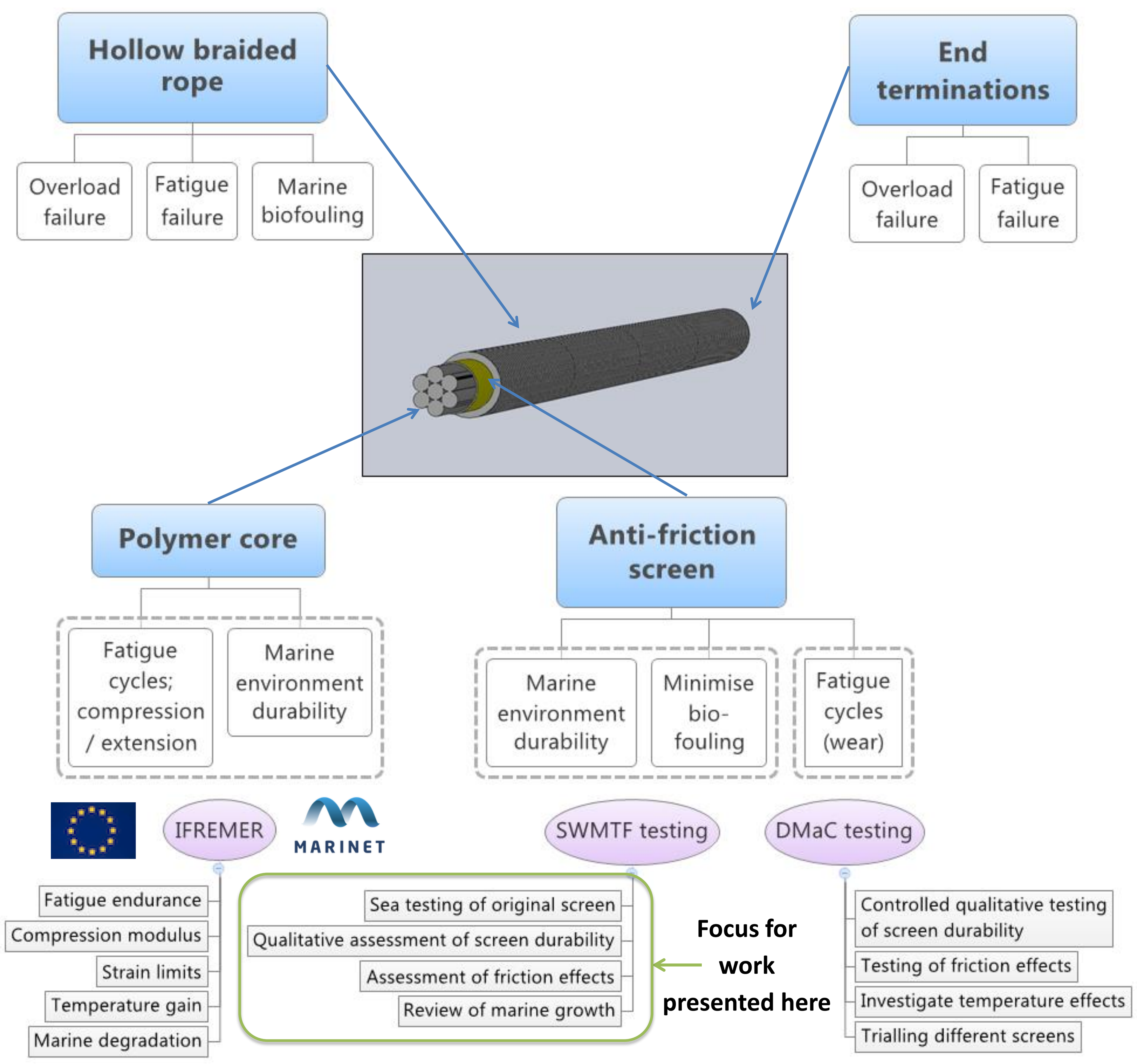


Figure 1: Key components and reliability considerations of tether, with research facilities and approaches detailed for selected components

References

[1] T Gordelier, D Parish, PR Thies, L Johanning. (2015) *A Novel Mooring Tether for Highly-Dynamic Offshore Applications; Mitigating Peak and Fatigue Loads via Selectable Axial Stiffness*, JMSE, 3(4): 1287-1310

Method

Four different tether prototypes were deployed on a limb of the South West Mooring Test Facility (SWMTF) from the 3rd June 2013 to 26th November 2013 to observe the affect of the marine environment on the different components of the tether.

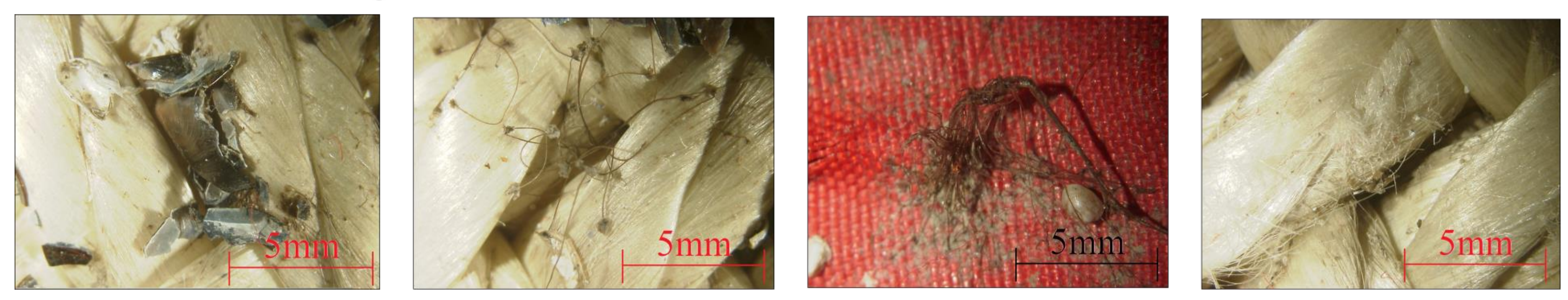
Figures 2 & 3: Four tether prototypes deployed at SWMTF

Results

Significant marine growth developed during the deployment but after cleaning with a brush and fresh water there was no external evidence of fretting.

Figures 4 & 5: Marine growth on Tether P1-8. Before (L) and after (R) cleaning

On opening up the tether for review, marine growth had penetrated all parts of the tether and the beginning of rope filament damage was evident due to this.



Figures 6 – 9: Mussel growth; byssal filaments on rope; byssal filaments on screen; rope filament damage.

The anti friction membrane showed signs of degradation, with pressure tears and areas of wear evident.

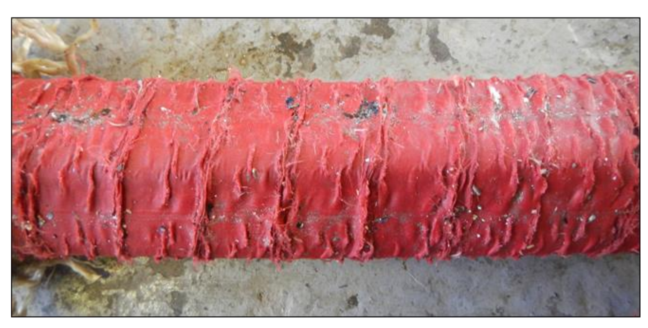


Figure 10: Anti-friction screen showing evidence of pressure tears and wear. Bio-fouling debris is also viable.

Conclusions and next steps

- A jacket should be developed to protect the Exeter Tether from marine biofouling as debris from this may cause long term damage to the Tether components.

- Alternative materials should be trialled for the anti-friction screen. Two alternative membranes have recently undergone extensive testing at the DMaC Test Facility.