

Component Reliability Testing

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Work stream 8: Reliability

Key factor reliability

“Survivability and reliability represent key challenges for marine renewables, due to the economic consequences of catastrophic failures and/or long periods of unavailability.” [1]

In the case of limited field experience, component reliability testing provides the following evidence:

- Reliability assurance
- Establishing failure modes
- Estimating failure rates

Test signal generation for mooring component

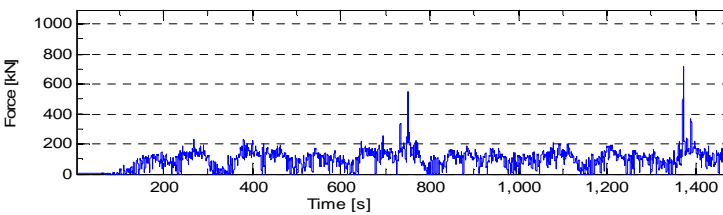


Fig. 1: Measured mooring tension line force of a generic OWC, measured in $H_s=3m$, $T=8s$; [Wave tank test carried out at 1:20, values for full-scale]

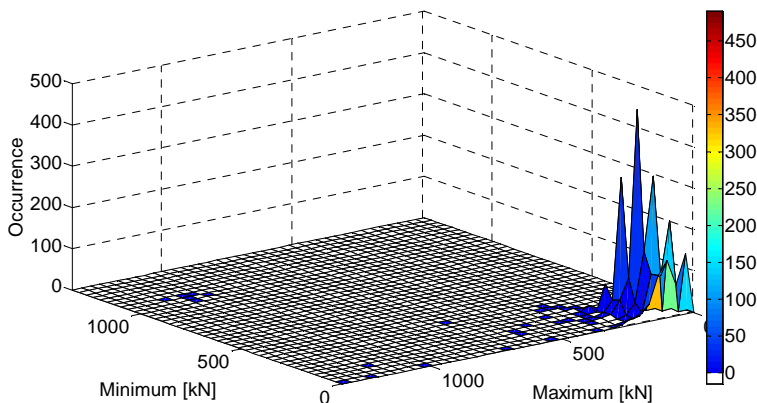


Fig. 2: Rainflow cycle matrix plot indicating the occurrence of mooring line tension load cycle ranges [kN]

Conclusion

Component reliability testing is a valuable tool to develop for the marine energy industry in order to gain much needed reliability information and demonstrate the reliability of devices prior to field deployment.

Further Work

- Statistical models and procedures for reliability tests and updating
- Test design and physical component testing

References

1. BOUD, R. (2006). Future marine energy. [Carbon Trust report].
2. HEULER, P., KLÄTSCHKE, H., (2005). Generation and use of standardised load spectra and load-time histories, Int. Journal of Fatigue, 27, pp. 974-990
3. THIES, P.R., JOHANNING, L. & SMITH, G.H.: Towards component reliability testing for Marine Energy Converters, Paper submitted to Ocean Engineering, Manuscript Ref. Nr.: OE-D-10-00180, 2010.

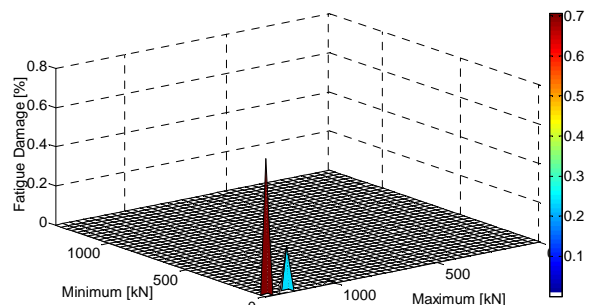


Fig. 3: Normalised fatigue damage matrix indicating the damage contribution of different rainflow cycles during the tank test

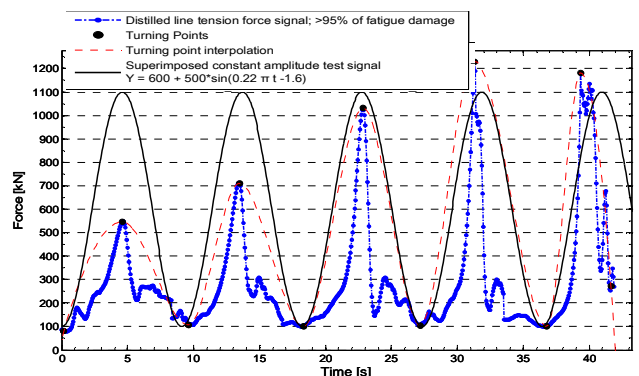


Fig. 4: Distilled mooring load signal [kN], turning points and indicative test regime replicating most severe load cycles (>95% fatigue damage)