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HydroNAS™ - The future of underwater noise mitigation

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Abstract

Offshore wind turbines are currently being installed at a rate of approximately one turbine per day across Europe. Each turbine installed must be mounted on a foundation which is typically attached to the seabed via a piled connection.

Mammals in close proximity to wind farm construction sites are at risk of permanent hearing damage. As a result, Governments and the European Union have already, and continue to develop legislation and regulation to manage underwater noise. For instance, within the German EEZ (Exclusive Economic Zone) the maximum permissible noise is **160 dB Sound Equivalent Level (SEL) at a distance of 750m**.

Objectives

W3G Marine Ltd (W3GM) has developed a product to mitigate underwater noise generated from offshore piling. In 2010 W3GM partnered with EATEC Ltd, an acoustics specialist with a proven track record of solving complex 'noise' problems.
Dr Michael Bellmann has also been consulted on the project from 2013.

The objective of the project was to design a system which:
- ✓ Has **unparalleled performance** in noise mitigation
- ✓ Provides user with **lightweight**, **highly versatile**, **low cost** solution
- ✓ Can be **easily deployed** and is **off the critical path** of the main installation vessel

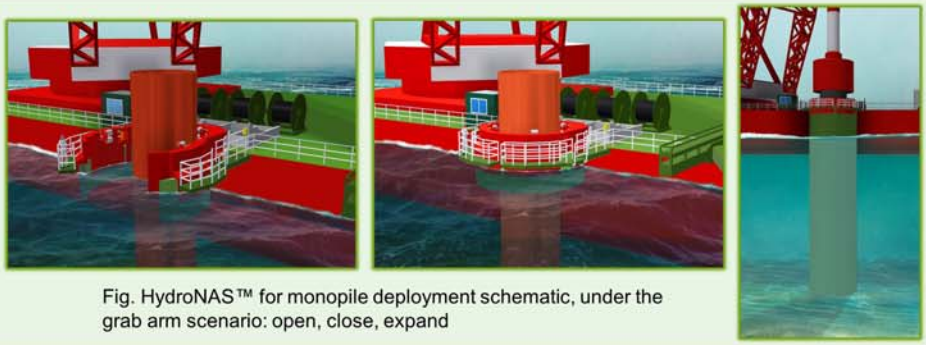


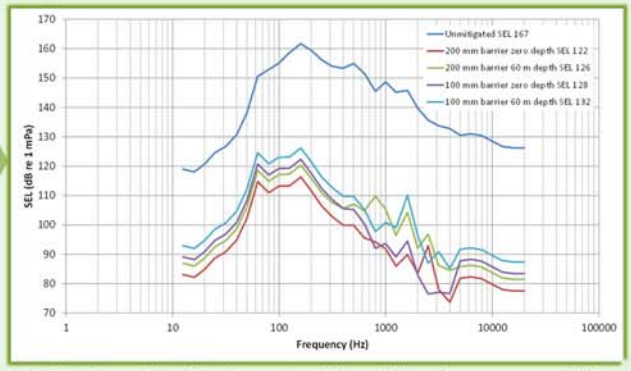
Fig. HydroNAS™ for monopile deployment schematic, under the grab arm scenario: open, close, expand

Methods

➢ Proof of concept (2010)
Result – Concept works

➢ 10m water depth quayside trail of an un-optimised system (2013)
Result - **12db-14dB SEL reduction at 750m**

➢ Optimisation trial at NPL (2013)
Result – multiple barriers improve performance



➢ ISVR Consulting (Southampton University) performance prediction analysis (2014).
Result – **Up to 44 dB SEL reduction at 750m predicted** for offshore piling.

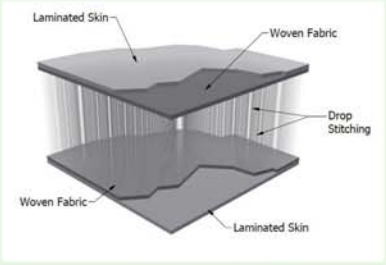


Fig. Drop stich material

The HydroNAS™ concept is simple. It's an unbroken column of air around the pile from the seabed to the surface. This creates **water-air-water impedance mismatch** which is widely regarded as the simplest and most effective method of reducing underwater noise. The solution identified and patented by W3GM uses a lightweight inflatable fabric which is restrained internally, such as drop stitch.

Upon the inflation of drop stitch, a fixed volume panel of air is created which maintains a specified geometry underwater avoiding ballooning which would otherwise occur. The cells are modular, stackable and can be configured to fit any water depth, pile diameter or any type of pile.

W3GM also has patents covering the use of an indexing arm within a **piling template**. The guide slot is shrouded in HydroNAS™.

Conclusions

As a result of over four years of R&D investment, W3GM will prove HydroNAS™ offshore during 2015. **The system provides developers and installation contractors with a safe, efficient and cost effective noise mitigation system alternative which can be tailored to suit exact project requirements**. The use of HydroNAS™ can result in no lost main vessel time representing a further cost saving. In addition HydroNAS™ solves other challenges such as seabed bearing strength issues and can even be preinstalled onshore onto a monopile avoiding costly offshore operations. HydroNAS™ solves all underwater noise challenges faced by the industry at a fraction of the current cost.

References

1. Wilkie F, Kloske K, Bellman M. ESRa – Evaluation of Systems for Ramming Noise Mitigation at an Offshore Test Pile. 2011
2. Bundesamt für Seeschifffahrt und Hydrographie /Federal Maritime and Hydrographic Agency. Offshore wind farms: Measuring instruction for underwater sound monitoring. 2011
3. Joint Nature Conservation Committee, Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise. 2010