



NERC Centre for Doctoral Training in Oil & Gas (2018 start)

Project Title: Effect of Marine Growth on Offshore Civil Engineering Structures

Host institution: University of Dundee

Supervisor 1: Rod Jones

Supervisor 2: Sue Dawson

Additional Supervisor (s): Tom Dyer, Geoff Gadd and Saverio Spadea

Project description:

The proposed project aims to determine the effects of marine growth on the behaviour of offshore structures. Such as decommissioned O&G structures, wind turbines and tidal stream generators. Marine growth could have a number of effects that could cause structural instability in the long-term. These include increasing the size of submerged elements, leading to increased projected areas, increased drag coefficients and displaced volume and hence to increased hydrodynamic loading. Elements may become more hydrodynamically instable and increase the amount of vortex shedding as well as leading to a reduced natural frequency and hence to an increased dynamic amplification factor. This could also lead to sea bed scouring. A further issue is that of invasive species hosting.

In the case of decommissioned gravity base structures (GBS) in the North the key assumption for derogation is that the residual structural performance will be mechanically stable over very long periods (>500 years). The only way in which this can be done is by extrapolation of experience of terrestrial structures and coastal infrastructure. There is, however, little evidence that this has any validity and what modelling that has been carried has taken no account of marine growth (eg Dunlin A by Atkins and Dundee).

The project will be split into 3 parts. The first stage will concentrate on data gathering and physical modelling of different levels of marine growth on structural element and the effects it may have on long-term durability and performance. In the second stage, the issue of invasion species host will be studied and taking one material only viz concrete, how its surface can be modified to limit or prevent hosting will be examined. The third stage will develop a numerical approach to extrapolate these effects into the long-term future behaviour of decommissioned GBS's in the North Sea and carry out a risk analysis of ultimate and accidental limit states.

CDT Research theme(s):

Environmental Impact and Regulation - Decommissioning

Research context:

Long-term marine growth on gravity base structures could have consequences that have not been accounted for in derogation plans for abandonment. There is also a risk that they will provide a ready platform for invasive species in the North Sea and it is vital that this is understood and planned for.

Research costs:

Research costs: The cost of this proposed research include (1) fees; (2) stipend; (3) consumables and costs for building the flume; and (4) travel to stakeholders to obtaining site info for analyses.

Career routes:

The interdisciplinary knowledge and skills acquired by the PhD student will enable him/her to become an expert and skilled researcher in offshore structural behaviour due to marine growth.