Stress and Fatigue Analysis of Subsea Umbilical and Cable Systems

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Abstract

With the ever changing energy requirements & demand for better communication links across the planet, subsea umbilical & cable requirements are becoming more stringent. Where longer service life at a lower cost is now expected from manufacturers. In addition to this, with the need to exploit more sustainable energy sources from offshore wind & wave, where extreme weather conditions are encountered, harvesting and providing a continuous link from these sources to the worlds energy grid requires dynamic power cable structures which can survive under severe load conditions. With this, cable companies are now turning to multiphysics modeling to reduce the cost of materials and thus manufacture, while maintaining cable performance and long service life under these higher demands. In this, a MATLAB® GUI is developed which automatically builds & generates full 3D COMSOL Multiphysics models for subsea cable analysis. Reducing turn-around times to assess material options, component layout, stress concentration areas, fatigue & service life of various cable designs in a few days.

Figures used in the abstract

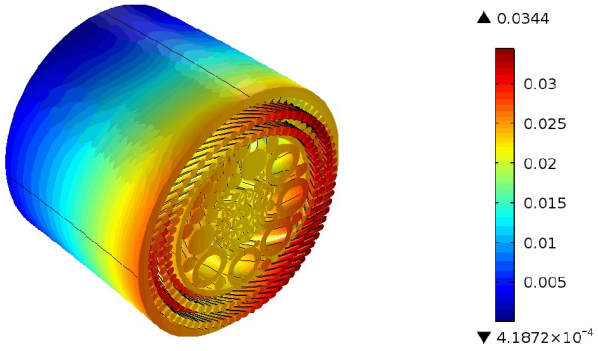

Figure 1: 3D cross-section of cable, illustrating cable displacement & slip conditions between armour wires & internal umbilical structures.

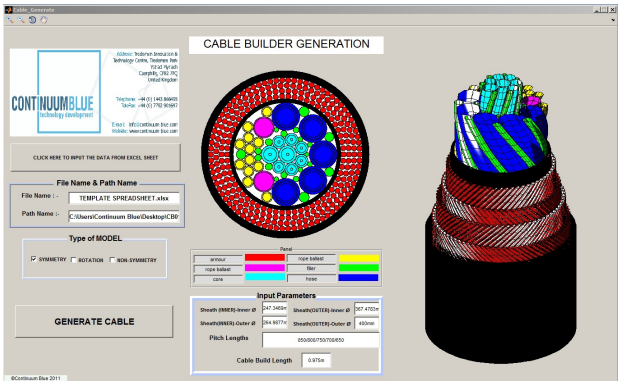

Figure 2: Screenshot of MATLAB® GUI developed to generate subsea cables in COMSOL using Livelink™ for MATLAB®.