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OCEAN ENGINEERING

Ocean Engineering 30 (2003) 949–950

www.elsevier.com/locate/oceaneng

Letter to Editor

Comments on: "Semi-analytical quasi-static formulation for three-dimensional partially grounded mooring systems problems" by Y.T. Chai, K.S. Varyani and N.D.P. Barltrop, 2002. Ocean Engineering 29, 627-649.

Drs Chai, Varyani and Barltrop are to be congratulated for obtaining a very useful and elegant formulation for solving three-dimensional partially grounded and fully suspended multi-leg mooring system problems. As stated by the authors the approach allows for a quick parametric analysis of different configurations of multi-leg mooring systems as well as different types of flexible riser set-ups.

The writers are particularly interested in the treatment of the cable constitutive relation and properties. It is reasonable to assume a linear cable constitutive relation, the proportionality constant being the "apparent elastic modulus": E_K in their equation (10). Since in the case of synthetic fibre rope E_K is stress dependent the authors propose the usage of a "tangent apparent elastic modulus" constant throughout the sub-segment length based on the stress resultant acting at its midpoint.

The writers agree with this proposition also but they would like to remind ocean systems designers that the apparent Young modulus of wire ropes increases with usage. On the other hand this increment of the value of E_K cannot be considered as an increment of the safety factor from a design viewpoint. Paradoxically, an increase of breaking strength of a wire rope is a sign of rope degradation. The increment may be caused by lubricant degradation or corrosion, for example (Weischedel and Chaplin, 1991).

When dealing with synthetic fibre rope one must be aware, in general, of viscoelastic effects (mainly creep and relaxation phenomena).

A question which may carry considerable practical weight is the variation of the cross sectional area of the cable as a function of the applied stress. One can obtain then an "apparent Poisson modulus" of the cable which can be considerably larger than Poisson's modulus of linearly elastic, continuous media: $\mu \leq \frac{1}{2}$ (Laura et al., 1970).

Obviously this considerable reduction of the wire rope cross sectional area does possess important influence on the prediction of stress resultants and geometric configuration of a cable system in the ocean environment. For instance the drag force will be considerably affected.

doi:10.1016/S0029-8018(02)00046-X

Acknowledgements

Research on cable properties and dynamic behaviour is sponsored at the Institute of Applied Mechanics (IMA) by the Secretaría General de Ciencia y Tecnología of Universidad Nacional del Sur and by the CONICET Research and Development Program.

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