The competition between plasticity and abrasive wear as the primary failure mechanism of offshore mooring components

Thiago Doca* and Matheus Zegatti

* Department of Mechanical Engineering (ENM)
University of Brasília (UnB)
Campus Darcy Ribeiro, SG9 – Brasília, Brasil
(*) corresponding author: doca@unb.br

ABSTRACT

The aim of this work is to identify the primary failure mechanism of offshore chain links and connectors [1]. We focus on the numerical modelling of the contact surfaces for the analysis of the plastic strains and wear depth at different cyclic loading conditions. However, the numerical results are also compared with experimental data [2]. For a precise evaluation of the plastic strains, an element technology capable of dealing with plastic incompressibility while avoiding volumetric locking [3] is included. The wear effect is modelled using a local energy dissipated model [4,5] coupled with a topology update base on the ALE method. An estimation of the fatigue life [6] of the component is obtained using the Smith-Watson-Topper model [7]. Results show that, at lower levels of plastic deformation and low number of cycles, the fatigue life of the components is positively affected by the wear. On the other hand, at a higher level of plastic strain or number of cycles the material loss drastically reduce the fatigue life of the components.

Keywords: Plasticity, Abrasive wear, Fatigue life, Mooring components.

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