Local Joint Flexibility – Accurate modelling of Structural Assemblies

The design of truss-like structures, such as offshore jacket structures, include a large number of structural assemblies between the various structural components, such as the jacket node illustrated in Figure 1.

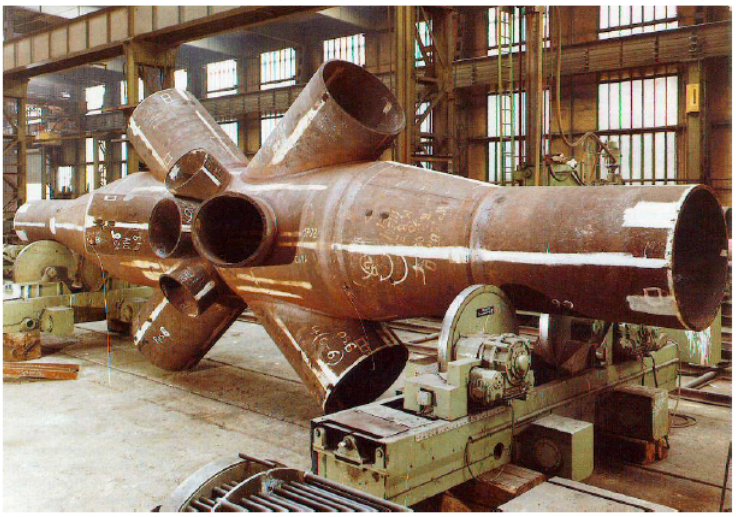

Figure 1 - Complex multiplanar welded joint

These joints can be modelled very crudely or by the more sophisticated, and commonly applied Local Joint Flexibility method, using the formulae derived by Buitrago, [1], which is the procedure provided by the DNV-GL standard for wind turbine support structures, [2]. These references, however, only apply to specific single planar joints in particular load ranges. Additional research looking into the field include [3] and [4].
This project aims at investigating the effect of more accurate modelling of various joint types, both on the local scale for verifying the specific joint, as well as the effect on the global behavior of the structure. This could be accomplished by a detailed 3D FE-model of the considered joint(s) in a commercial FE-package providing a generic and parametric
characterization of the joint. The detailed model could be calibrated to simplistic mechanical model for implementation in a global model of a jacket structure to identify the effects of the detailed modelling on e.g. fatigue life of joints as well as global section forces. Project tasks could include:

- Construction of 3D FE-model of the node(s)
- Parametric stiffness/dynamic characterization of the node.
- Static/dynamic condensation of the detailed model
- Implementation in a global jacket model

The above is meant as a guideline and additional/other relevant analysis ideas are welcomed.
The project is carried out as a collaboration between DTU and Wood Thilsted Partners.
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