A novel Node Design using High Strength Steel for Jacket Structures

With the increasing demand for green and renewable energy, the industry is looking into developing larger and more effective wind turbines for offshore use. The support structures for such offshore wind turbines are generally in risk of metal fatigue, due to the dynamic loading of wind and waves. With larger and heavier turbines, metal fatigue will be even more likely to occur in the welded sub-structures. In this PhD project, a new high strength steel welded joint for offshore jacket structures is being developed in close cooperation with industry partners to reduce the overall cost of jackets and to ensure that the new generation of turbines can be built.

When designing offshore structures considering metal fatigue, the material parameters are often considered deterministic and manual iterations for finding the optimal design is performed. This makes the design process slow and the safety in design perhaps too large. The aim of this PhD project is to develop an optimization framework capable of optimizing the welded structures in offshore foundations considering both fatigue and stochastic parameters. To develop this framework research into the following topics are required:

- Multiaxial fatigue assessment of welded joints
- Stochastic finite element analysis
- Weld improvement methods

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