Conceptual jacket design by structural optimization - DTU Orbit (06/11/2019)

Conceptual jacket design by structural optimization
We present an approach for sizing optimization of jacket structures and apply it to investigate the conceptual design of jackets for offshore wind turbines. Conceptual design is an input to early structural and financial models, and we assume simplified analysis and load models. A four-legged jacket for the DTU 10-MW wind turbine in 50-m water depth is modelled by Timoshenko beam finite elements, and the structural dimensions of the beam cross sections are considered as continuous design variables. A structural optimization problem is formulated to minimize the jacket mass, with constraints on fatigue and ultimate limit states. The optimal design problem is then used to investigate how the optimized mass depends on the number of bays and the jacket leg distance. The conceptual design investigation led to a new conceptual design with 14% lower mass compared with the original conceptual design. We conclude that structural optimization can provide useful insights in the conceptual design phase and lead to a better starting point for the further design and planning processes.

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