

Synthesis of preliminary system designs for offshore oil and gas production - DTU Orbit (08/11/2017)

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The present work deals with the design of oil and gas platforms, with a particular focus on the development of integrated and intensified petroleum processing plants. It builds on a superstructure based approach that includes all the process steps, transformations and interconnections of relevance, to generate and compare a large number of alternatives. The superstructure is formulated based on engineering knowledge and is coupled to process models developed in Aspen and Matlab, together with multi-objective optimisation routines and uncertainty assessments. It takes actual measurements from North Sea fields and three petroleum compositions as starting points. The significance of the uncertainties associated with the feed properties, and the capital costs, taxes and lifetime, is assessed. The results indicate that (i) the system performance strongly depends on the level of mass integration within the platform, (ii) the oil and gas recoveries are markedly impacted by the number of separation stages and heat exchangers, and (iii) disregarding the interactions between the several plant sections lead to sub-optimum solutions. The application of this framework proves to be useful for eliminating inadequate configurations and screening potentially novel solutions at early stage designs, with respect to technical, energetic and economic criteria.

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