

On the Simulation of Offshore Oil Facilities at the System Level

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Offshore oil facilities are complex systems involving elaborate physics combined with stochastic aspects related, for instance, to failure risk or price variation. Although there exist many dedicated software tools to simulate flows typically encountered in oil exploitations, there is still no tool that combines physical (mostly engineering fluid mechanics) and risk simulation. Such a tool could be useful to engineers or decision makers for specification, design and study of offshore oil facilities. We present a first step towards the creation of such a tool. Our current simulator is based on new Modelica components to simulate fluid flows and on stochastic simulation at a higher level, for modeling risk and costs. Modelica components implement physical models for single and two-phase flows in some typical devices of an offshore field. The risk simulation is performed with Scilab and receives data from the Modelica simulation. It uses Markov chains and statistical indicators to assess performance and resilience of the system over several months or years of operation. The presented simulation framework can be used to compare different designs of an offshore oil facility, in order to choose the most productive and/or robust, depending on the choice of the performance evaluator.

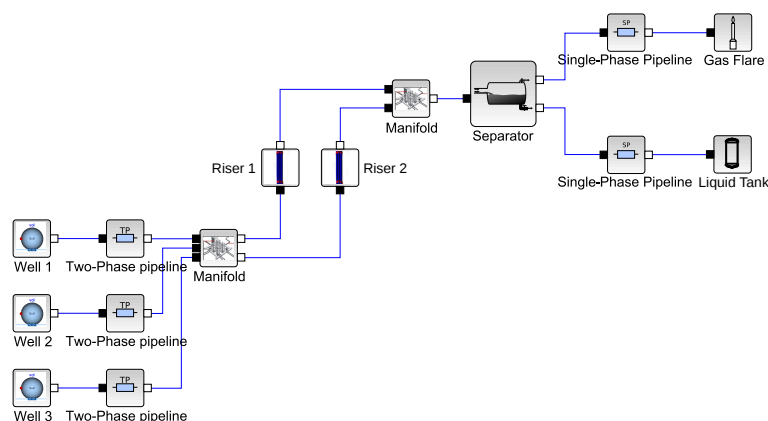


Figure 1: An example of simulated system, which includes some typical components of an offshore facility (lines, risers, separator, etc.)