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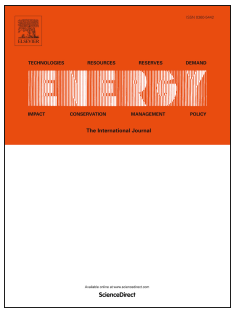

System evaluation of offshore platforms with gas liquefaction processes

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System evaluation of offshore platforms with gas liquefaction processes

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Abstract

Floating, production, storage and offloading plants are facilities used for offshore processing of hydrocarbons in remote locations. At present, the produced gas is injected back into the reservoir instead of being exported. The implementation of refrigeration processes *offshore* for liquefying natural gas provides the opportunity to monetize offshore gas resources. The present work analyzes the performance of offshore platforms, from the oil processing to the gas liquefaction system. Different feed compositions, system layouts and liquefaction processes are considered. Potential system improvements are discussed based on an energy and exergy analysis. Compared to a standard platform where gas is directly injected into the reservoir, the total power consumption increases by up to 50 %, and the exergy destruction within the processing plant doubles when a liquefaction system is installed. It is therefore essential to conduct a careful analysis of the trade-off between the capital costs and operating revenues for such options.

Keywords: Gas liquefaction, Offshore platforms, Thermodynamic analysis, Process integration

1. Introduction

Oil and gas platforms are energy-intensive systems requiring mechanical/electrical power, cooling and possibly low-temperature heating. The design and energy demands of these facilities depend on the field conditions (e.g. temperature and pressure), feed properties (e.g. oil, gas, water and carbon dioxide contents), and operating strategies (e.g. gas injection or export) [Bothamley,2004]. However, as pinpointed in Voldsund et al.[2014], operations such as separation, compression, pumping, and power generation are present on all facilities.

Floating production, storage and offloading (FPSO) facilities have gained more and more attention in the last decade, as they are easy to install and are more flexible than 'fixed' facilities. FPSOs are ship-shaped vessels which may be operated at large distances from the shore, and gas exportation through pipelines is infeasible.Offshore liquefaction of natural gas gives the opportunity to avoid flaring or re-injection and to monetize gas produced in remote locations.

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