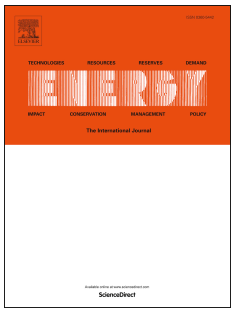
Accepted Manuscript



Life performance of oil and gas platforms for various production profiles and feed compositions

Tuong-Van Nguyen, Silvio de Oliveira Júnior

PII: S0360-5442(18)31418-X

DOI: 10.1016/j.energy.2018.07.121

Reference: EGY 13386

To appear in: *Energy*

Received Date: 13 March 2018

Revised Date: 13 July 2018

Accepted Date: 18 July 2018

Please cite this article as: Nguyen T-V, de Oliveira Júnior S, Life performance of oil and gas platforms for various production profiles and feed compositions, *Energy* (2018), doi: 10.1016/j.energy.2018.07.121.

Life performance of oil and gas platforms for various production profiles and feed compositions

Tuong-Van Nguyen[a,b,*], Silvio de Oliveira Júnior[a]

[a] *Laboratory of Environmental and Thermal Engineering, Polytechnic School - University of São Paulo, Av. Prof. Luciano Gualberto, 05508-900 São Paulo, Brazil*
[b] *Section of Thermal Energy, Department of Mechanical Engineering, Technical University of Denmark, Building 403, Nils Koppels Allé, 2800 Kongens Lyngby, Denmark*

Abstract

Oil and gas platforms present similar structural designs but process fluids with different thermo-physical and chemical properties, and with varying flowrates (variability of the gas-to-oil and water-to-oil ratios over time). It is therefore not possible to suggest a standard flow diagram of these facilities. Different processes and operating modes may be implemented to maximize the petroleum production and improve the overall system performance. The present work evaluates, in a first step, the variations of the heating, cooling and power demands over time, in terms of energy and exergy. The simulations were calibrated using actual field data (feed compositions and production profiles). In a second step, the minimum energy and exergy losses of the platform are assessed by performing a thermodynamic analysis, assuming an ideal scenario in which all processes are run at their design points. This approach proves to be useful for evaluating consistently different options for oil and gas production, and for determining, in a further step, the most promising solutions for minimizing the energy use over a field lifetime. The compression (natural gas and carbon dioxide) processes represent the major share of the total power demand ($\geq 80\,\%$) for all feed compositions, at all stages of the field life. The power and heat generation system is responsible for about 60 to 70 % of the total exergy destruction over time, followed by the gas treatment and membrane units. Efforts should therefore focus on a more efficient design and operation of the gas compression units, which are designed to handle the peak production of hydrocarbons, and on the valorisation of the turbine exhausts. Alternative CO_2-treatment processes may also be of interest for feeds with high CO_2-composition.

Keywords: Oil and gas platform, energy analysis, process modelling, exergy analysis, lifetime performance

1. Introduction

Offshore platforms include similar process operations worldwide: oil, gas and water separation; oil stabilization; gas compression and purification; produced water treatment. Hydrocarbon processing may be

*Principal corresponding author. Tel.: +45 4525 4129
Email address: tungu@mek.dtu.dk (Tuong-Van Nguyen)