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Pierobon, Leonardo; Nguyen, Tuong-Van

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Leonardo Pierobon¹, Tuong-Van Nguyen¹

¹ Technical University of Denmark, Department of Mechanical Engineering, Nils Koppels Allé, Building 403, 2800 Kgs. Lyngby, Denmark
¹ Corresponding author, Tel.: +45 4525 4129, Fax: +45 4593 5215, Email: lpier@mek.dtu.dk

1 Motivation
With increasing incentives for reducing CO₂ emissions, energy optimization on offshore platforms becomes a focus area. Gas turbines efficiency in offshore application typically ranges from 20-30%. To enhance their performance a bottoming cycle is introduced. A preferable technology is the organic Rankine cycle (ORC) because of its low gas turbine outlet temperature, space and weight restrictions. The case of study is the Draugen platform in the Norwegian Sea.

3 Plant Analysis
The plant is constituted by the Siemens SGT-500 twin spool gas turbine, the intermediate loop and the ORC. The low and high pressure axial compressors are mechanically coupled by two distinct shafts with the low and high pressure turbines while the power turbine drives the generator. The fuel is assumed to be natural gas.

Figure 3: Tube-arranged gas turbine Siemens SGT 500

DOWTHERM Q is utilized as heat carrier: it presents low viscosity, better thermal stability and heat transfer coefficient with respect to hot oils through its operating range [2]. The off-gases temperature requires fluids with a high critical temperature. Toluene, cyclohexane, cyclopentane and benzene are therefore selected as ORC working media.

Figure 4 shows that SGT-500 efficiency (31.4%) increases to 43.7% and 44.3% for case A (toluene) and B (cyclohexane). Net power output rises to 23.9 MW, meaning that, with a modified schedule for the three gas turbines, fuel consumption and emissions can be decreased.

5 Acknowledgements & References
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