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Publication date: 2012

Document Version
Publisher's PDF, also known as Version of record

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Citation (APA):
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1 Motivation and background

With increasing incentives for reducing CO₂ emissions, energy optimization on offshore platforms becomes a focus area. The waste heat recovery from the SGT-500 SIEMENS gas turbine utilized on the Draugen platform (Kristiansund) is investigated. Three possible technologies are considered: the air bottoming cycle (ABC), the organic Rankine cycle (ORC) and the steam Rankine cycle (SRC). Thermal efficiency, compactness, weight and investment cost are the major constraints.

Organic Rankine cycle

Pros:
- High thermal efficiency (up to 44.3%)
- Compactness
- No moisture at turbine outlet (“dry” fluid)
- Flexibility in the working fluid selection

Cons:
- Intermediate loop
- High fire hazard
- New technology

Steam Rankine cycle

Pros:
- Low maximum (10 bar) and high minimum pressures (0.1 bar)
- No intermediate loop
- Established technology
- Low hazard and environmental-friendly fluid

Cons:
- Low thermal efficiency
- Moisture at steam turbine outlet (5%)
- Need for make-up water

2 Results and discussion

The combination of the SGT-500 and ORC presents the highest system performance (44.3%) with cyclohexane (case a). When a low fire hazard is required carbon dioxide is the preferable media (case b). The ABC exhibits the lowest overall efficiency (35.8%) due to the high outlet ABC turbine temperature (220°C). If a SRC is utilized problems related to moisture content after the expansion are encountered; combined cycle efficiency is 40.2%.

3 Acknowledgements

Funding from the Norwegian Research Council through Petromaks led by Teknova with project no. 203404/E30 is acknowledged.