Extended Abstract

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Exergy analysis of a power plant in Abu Dhabi (UAE)

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Abstract:
The standard conditions used for the design of gas turbines are 15o C, sea level atmospheric pressure and 60% relative humidity. In Abu Dhabi, the performance of gas-turbine power plants is therefore affected by its specific atmospheric conditions since they are different from the ISO requirements. The main objective of this research work was to conduct an exergy analysis for a power-generation plant in Abu Dhabi (UAE) in order to investigate the effects of high temperatures and absolute humidity of ambient air on its performance. Our data showed that the temperature had more negative effects on the performance of the plant than the absolute humidity and the combustion chamber was the main source of irreversibility (70.2%). On the other hand, the compressor had the lowest contribution of exergy destruction (12.4%). Compared to the design conditions (T=15o C, RH=60%), our results indicated that in summer conditions (T=43o C, RH=50%), the power plant lost 4.66% of its net power output and 4.61% of its exergy efficiency. The first objective of this research was to conduct an exergy analysis for a power-generation plant in Abu Dhabi (UAE) in order to determine the main source of its irreversibility. Our results indicated that the combustion chamber was the main factor (70.2%) of the total exergy destruction of the plant. On the other hand, the compressor had the lowest contribution towards exergy destruction (12.4%). In the second part of this investigation, Aspen Hysys with the Soave-Redlich-Kwong (SRK) equation of state were utilized in order to simulate the effects of high temperatures and absolute humidity of ambient air on the exergy efficiency of the different equipment in the power plant. Our data showed that the temperature of ambient air had more negative effects on the performance of the plant than its absolute humidity. The exergy efficiency of the combustor and compressor decreased with temperature while the exergy efficiency of the turbine increased with temperature. Finally, a comparative study on performance of the power plant between design conditions (T=288K, RH=60%) and summer conditions (T=316K, RH=50%) in Abu Dhabi indicated that the power plant lost 4.66 % of its net power output and 4.61 % of its exergy efficiency. Despite the developments of a few years' wireless sensor networks, several constraints continue to limit their development and degrade the performance of their applications and services. Due to their limited power and signal range, some or all of the sensors may stop functioning, leading to the deterioration of network functionality such as monitoring, detection and data transfer. These networks require robust wireless communication protocols that are energy efficient. Thus, it is a challenge for the self-organization protocols to provide network survivability and redundancy features. In this paper, we present a novel clustering algorithm called EECDC (An energy efficient and coverage-aware distributed clustering protocol for wireless sensor networks), which aims to improve the applications performance and the quality of service (QoS) by exploiting geometry techniques. Better coverage, energy efficiency, minimum traffic from nodes to base station, balanced energy consumption are the main features of EECDC to improve life time of WSN. Simulation results confirm that EECDC is effective in prolonging the network lifetime as well as in improving the network coverage.

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