

[Advanced Search](#)

- [HOME](#)
 - [BROWSE JOURNALS & BOOKS](#)
 - [WORLD JOURNAL OF ENGINEERING](#)
 - [VOLUME 12, ISSUE 3](#)
-
- EXERGOCOECONOMIC ANALYSIS AND PERFORMANCE ASSESSMENT OF SELECTED GAS TURBINE POWER PLANTS

Exergoeconomic analysis and performance assessment of selected gas turbine power plants

Author(s):

[S.O. Oyedepo](#), (¹Mechanical Engineering Department, Covenant University, Ota 999062, Nigeria.),

[R.O. Fagbenle](#), (²Mechanical Engineering Department, Obafemi Awolowo University, Ile Ife 999062, Nigeria.),

[S.S. Adefila](#), (³Chemical Engineering Department, Covenant University, Ota 999062, Nigeria.),

[Md. Mahbub Alam](#), (⁴Institute for Turbulence-Noise-Vibration Interaction and Control, Shenzhen Graduate School, Harbin Institute of Technology, Shenzhen 518000, China.)

...Show less authors

Abstract:

In this study, exergoeconomic analysis and performance evaluation of selected gas turbine power plants in Nigeria were carried out. The study was conducted using operating data obtained from the power plants to determine the exergy efficiency, exergy destruction, unit cost of

electricity and cost of exergy destruction of the major components of a gas turbine engine in the selected power plants. The results of exergy analysis confirmed that the combustion chamber is the most exergy destructive component compared to other cycle components as expected. The total efficiency defects and overall exergetic efficiency of the selected power plants vary from 38.64 to 69.33% and 15.66 to 30.72% respectively. The exergy analysis further shows that the exergy improvement potential of the selected plants varies from 54.04 MW to 159.88 MW. The component with the highest exergy improvement potential is the combustion chamber and its value varies from 30.21 MW to 88.86 MW. The results of exergoeconomic analysis show that the combustion chamber has the greatest cost of exergy destruction compared to other components. Increasing the gas turbine inlet temperature (GTIT), both the exergy destruction and the cost of exergy destruction of this component were found to decrease. The results of this study revealed that an increase in the GTIT of about 200 K can lead to a reduction of about 29% in the cost of exergy destruction. From exergy costing analysis, the unit cost of electricity produced in the selected power plants varies from cents 1.99 /kWh (N3.16 /kWh) to cents 5.65 /kWh (N8.98 /kWh).

Keywords:

[Exergy](#), [Exergo-economic](#), [Gas turbine](#), [GTIT](#), [Exergy cost](#), [Electricity](#)

Publisher:

Emerald Group Publishing Limited

Received:

5 February 2015

Accepted:

25 May 2015

Copyright:

Published by Emerald Group Publishing Limited

Citation:

[S.O. Oyedepo](#), [R.O. Fagbenle](#), [S.S. Adefila](#), [Md. Mahbub Alam](#), (2015) "Exergoeconomic analysis and performance assessment of selected gas turbine power plants", World Journal of Engineering, Vol. 12 Issue: 3, pp.283-300, <https://doi.org/10.1260/1708-5284.12.3.283>

[Buy this item: \\$32.00](#) 30 days: [download](#), [save](#), [print](#)

Related articles

1. [Performance evaluation of selected gas turbine power plants in Nigeria using energy and exergy methods](#)

S.O. Oyedepo, World Journal of Engineering

2. [Exergoenvironomic modelling and performance assessment of selected gas turbine power plants](#)

Sunday Olayinka Oyedepo, World Journal of Engineering

3. [On-design exergy analysis of a combustor for a turbojet engine: a parametric study](#)

Ahmet Topal, Aircraft Engin and Aeros Techn

1. [Performance Evaluation of an Experimental Turbojet Engine](#)

Selcuk Ekici et al., International Journal of Turbo & Jet-Engines

2. [How To Get Wind Turbines To Work Harder](#)

Inderscience Publishers, ScienceDaily

3. [Energy- and exergy-based performance evaluation of solar powered combined cycle \(recompression supercritical carbon dioxide cycle/organic Rankine cycle\)](#)

Singh et al., Clean Energy

Favourites

 Reprints & Permissions

Journal Information



World Journal of Engineering

ISSN: 1708-5284

Online from: 2011


Subject Area: Engineering

•

 **Clarivate
Analytics**

Emerging Sources
Citation Index

Scopus[®]

 Publish open access
in this journal

