

Energetic and Exergetic Analysis of Internal Combustion Engine Cogeneration System

F. Mohammadkhani¹, Sh. Khalilarya^{2*}, I. Mirzaee³

¹ Department of Mechanical Engineering (MSc Student), Urmia University, Urmia, I.R. Iran
st_f.mohammadkhani@urmia.ac.ir

² Department of Mechanical Engineering (Associate Professor), Urmia University, Urmia, I.R. Iran
sh.khalilarya@urmia.ac.ir

³ Department of Mechanical Engineering (Associate Professor), Urmia University, Urmia, I.R. Iran
i.mirzaee@urmia.ac.ir

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Abstract

In this article, the first and second law analysis of diesel engine based cogeneration system was performed. Fuel utilization efficiency, rate of power, and rate of process heat of the plant were determined and various efficiencies based on both energy and exergy methods and the performance assessment parameters are defined for both the system components and the entire cogeneration plant. The objectives of this study are to calculate the exergy destruction within the plant and exergy loss to the environment and apply the performance assessment parameters to the components and entire cogeneration plant. The system under survey in this work was a diesel engine based cogeneration system that produces 250 kW of electricity and increases the temperature of water from 80 °C to 120 °C at 2 bar and 1.75 kg/s. The analysis showed that the least efficient component in the system is diesel engine with the exergetic efficiency of 39.31%. Also, fuel utilization efficiency of the overall plant was found to be 90.47% and the exergetic efficiency was 51.08%.

Keywords: Energy, Exergy, Efficiency, Diesel engine, Cogeneration.