Peter Olabisi Oluseyi, Ifunanya Lilian Ezike
Structure and Environment 2021, vol. 13, (1), pp. 16-28, Article number: el 003
https://doi.org/10.30540/sae-2021-003

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Structure and Environment
ISSN 2081-1500
e-ISSN 2657-6902
https://content.sciendo.com/sae
https://www.sae.tu.kielce.pl

sciendo

Kielce University of Technology

DOI: 10.30540/sae-2021-003

RETROFITTING EXISTING OFFICE BUILDING FOR EFFICIENT ENERGY MANAGEMENT AND PERFORMANCE

MODERNIZACJA ISTNIEJĄCEGO BUDYNKU BIUROWEGO DLA EFEKTYWNEGO ZARZĄDZANIA ENERGIĄ

Peter Olabisi Oluseyi[1], Ifunanya Lilian Ezike[1]
[1]Department of Electrical and Electronics Engineering, University of Lagos, Nigeria

Abstract

This study focuses on designing an efficient energy utilization protocol for the University of Lagos Senate office building, to ensure the reduction of energy consumption, reduce the cost of power and also ensure energy efficiency. Pre-retrofitting, the energy consumption cost for the UNILAG senate office building was calculated to be ₦20, 236, 962 i.e. 776.78 EUI (kWh/m²/y) using the appliance approach. The impact of various retrofitting methods was also simulated and measured utilizing BIM tools such as Autodesk Maya, Autodesk Revit and Autodesk Insight. This resulted in an estimated reduction in energy consumption cost to between ₦19,304,038.05 and 18,549,199.3 post retrofitting, this translates to about 712 EUI (kWh/m²/y). Results show that a 4.61-8.34% reduction in energy usage for the senate house can be achieved using the methods proposed in this research.

Keywords: Building Information Management (BIM), Energy Retrofitting Interventions, Heating Ventilation and Air-Conditioning (HVAC), Green Building Extensible Mark-up Language

Streszczenie

Praca koncentruje się na opracowaniu procedury efektywnego wykorzystania energii w budynku biurowym Senatu Uniwersytetu w Lagos w celu zapewnienia redukcji zużycia energii, redukcji jej kosztów i zapewnienia efektywności energetycznej. Przed modernizacją koszt zużycia energii w budynku Senatu został obliczony jako ₦20, 236, 962, tj. 776.78 EUI (kWh/m²/y) w oparciu o zamontowane urządzenia. Symulowano wpływ różnych technik modernizacyjnych i prowadzono obliczenia korzystając z narzędzi opartych o technologię BIM, tj. Autodesk Maya, Autodesk Revit i Autodesk Insight. To doprowadziło do przewidywanej redukcji kosztów energii pomiędzy ₦19,304,038.05 i 18,549,199.3 po modernizacji, co odpowiada ok. 712 EUI (kWh/m²/y). Wyniki wskazują, że możliwa jest redukcja zużycia energii dla budynku Senatu na poziomie 4.61-8.34% w oparciu o metody przedstawione w pracy.

Słowa kluczowe: modelowanie BIM, modernizacja energetyczna, ogrzewanie, wentylacja i klimatyzacja (HVAC), oprogramowanie Green Building Extensible Mark-up Language

*Department of Electrical and Electronics Engineering, University of Lagos, Nigeria, e-mail: ifunanya_ezike@yahoo.com

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