

The Optimal Sustainable Insulation Material by Using MCDM Analysis

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Abstract

Increasing fuel costs is the new norm, and an increase in energy consumption leads to many troubles, such as a growing of harmful environmental emissions and rise in energy consumption bills. Hence, it's desirable and recommended to estimate the value of energy consumed for buildings in the first design state in order to reduce the impact of these issues, and obtain a sustainable building using thermal insulation for the buildings (walls, roofs, floors...). The purpose of this experimental analysis is to determine the best insulating material among 12 selected materials, as the properties of these materials were analysed based on several criteria. The study focuses on using multiple analysis methods in order to achieve the best results and to eliminate potential inconsistencies of data with available scientific methods. The evaluation is conducted via implementing three multiple criteria decision-making methods (MCDM) the full Multi-Objective Optimization on the basis of Ratio Analysis (MOORA) multiplication, rating the choices and selection the solution nearest to ideal, Vlekkriterijumsko KOMPromisno Rangiranje (VIKOR) and the method of ordering options by analogy with the optimal method (TOPSIS). In addition to the significance of the criteria, find the weights of the criterion in the analysis by using the correlation between criteria (CRITIC). Results based on pre-established methods showed consistent results, with the highest and worst performing materials identified in buildings. Extruded polystyrene foam (XPS) is ranked the best among other materials. The number of articles related to MCDM isn't that high. Therefore, this study will contribute to filling the gap.

Keywords

CRITIC; Energy Efficiency; Insulation materials; MCDM Analysis; Multi-MOORA; Sustainable; TOPSIS; VIKOR.