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Development of parametric Kelvin structures will closed cells (Conference Paper)

Şerban, D.-A.[a,b], **Linul, E.**[b], Sărăndan, S.[c], Marşavina, L.[b]

[a] Research Institute for Renewable Energy, Polytechnic University of Timisoara, 138 G. Musicescu Str., Timişoara, Romania

[b] Department of Mechanics and Strength of Materials, Polytechnic University of Timisoara, 1 M. Viteazu Blvd., Timişoara, Romania

[c] Department of Physical Education and Sports, Polytechnic University of Timisoara, 1 M. Viteazu Blvd., Timişoara, Romania

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Abstract

This work presents the design of a parametric Kelvin structure in which the relative density of the geometry can be varied by adjusting three parameters: cell diameter, cell wall thickness and cell chamfer radius, the structure consisting of a tessellation of hollow truncated octahedral. The developed model was evaluated in terms of compressive stiffness for the case of a rigid polyurethane foam of 0.256 relative density. Three models were analyzed in order to determine the influence of geometric characteristics on mechanical properties: a model that presented no chamfer a model that presented a medium-sized chamfer and a model that presented a large chamfer. A mesh convergence study was performed which analyzed the results in terms of accuracy and time expenses for three element sizes for both linear and quadratic elements. Due to the orthotropic nature of the model, its response on both possible loading directions was investigated. Simulation results were compared with experimental results and yielded accurate results for one loading direction, when using the material properties for solid polyurethane described in literature. © 2016 Trans Tech Publications, Switzerland.

Author keywords

Cellular materials; Elasticity; Kelvin structure; Parametric model

Indexed keywords

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Cell-wall thickness; Cellular material; Compressive stiffness; Geometric characteristics; Kelvin structures; Parametric modeling; Quadratic element; Rigid polyurethane foams

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Şerban, D.-A.; Research Institute for Renewable Energy, Polytechnic University of Timisoara, 138 G. Musicescu Str., Timişoara, Romania; email:dan.serban@upt.ro

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