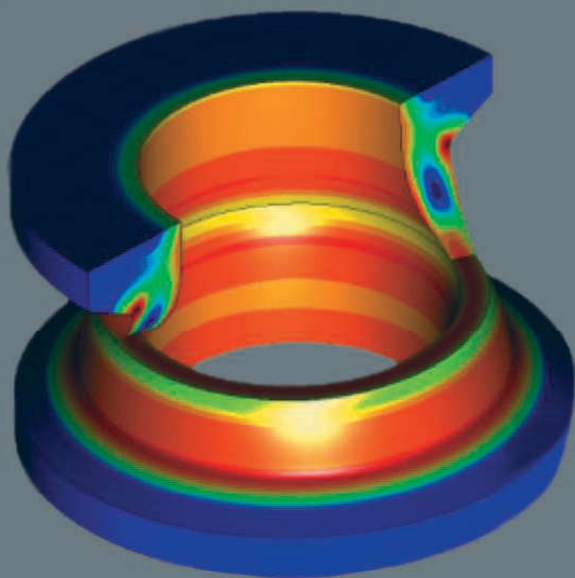




cmn2019

Congress on Numerical
Methods in Engineering
Congresso de Métodos
Numéricos em Engenharia
Congreso de Métodos
Numéricos en Ingeniería

July 01-03, 2019

Editors
Paulo B. Lourenço *University of Minho*
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Stéphane Clain *University of Minho*



Universidade do Minho
Escola de Engenharia



Universidade do Minho
Escola de Ciências

APM|AC SEMNI

Congress on Numerical Methods in Engineering

Congresso de Métodos
Numéricos em Engenharia

Congreso de Métodos
Numéricos en Ingeniería

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Preface

CMN 2019 aims to be a forum for the discussion of relevant scientific, and technological developments in computational mechanics, numerical methods and engineering applications. CMN 2019 is jointly organized by the Portuguese (APMTAC) and the Spanish (SEMNI) Associations and follows the previous congress editions of Madrid (2002), Lisbon (2004), Granada (2005), Porto (2007), Barcelona (2009), Coimbra (2011), Bilbao (2013), Lisbon (2015) and Valencia (2017).

The scientific program comprises six plenary lectures from internationally known researchers and is structured in almost 30 thematic sessions in different fields of research. We sincerely thank the session organizers for their contribution for the success of the congress.

The congress is open to everyone interested in numerical methods and the objective of the series is to create an excellent forum for dissemination of the latest scientific and technical developments and for the exchange of new ideas in emerging topics. We hope this can be achieved and the participants enjoy the technical and social program planned, together with the welcoming and UNESCO World Heritage city of Guimarães.

More than 275 participants from 30 countries are expected making CMN 2019 a truly international event. We are happy to share with you an exciting program composed of almost 300 contributions concerning a wide range of activities and research fields in numerical methods. The series of conferences benefits immensely from joining young participants (and the future of our community) with more senior academics and professionals, with a very attractive conference fee for young participants. Young participants totalize 40% of the participants, which is to be noted.

Thinking about the young participants, a unique presentation possibility is offered with oral (more formal and less interactive) and poster (informal and interactive) presentations of the same paper. We are also happy that three post-congress advanced software courses are offered to all participants, again at a modest fee, which total more than 50 participants.

We warmly thank the contributors, the authors, the speakers and the exhibitors of the event and wish this conference will offer you fruitful discussions and a pleasant time in Guimarães.

Guimarães, July 2019

Paulo B. Lourenço, Paulo Flores & Stéphane Clain, for APMTAC

David Greiner, Irene Arias & Manuel Tur, for SEMNI

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THERMAL MODELLING OF AN ACTIVE FAÇADE INTEGRATING A METALLIC UNGLAZED THERMAL COLLECTOR

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Keywords: Solar collector, CFD, Thermal behaviour, Steady state, Convection and Radiation

Abstract. *This research is focused on the prediction of the thermal behaviour of a novel unglazed metallic solar collector integrated into a sandwich panel. A specific CFD model has been proposed for thermal performance analysis and optimization based on the alternatives of operational parameters.*

All simulations were performed using a coupled ANSYS-FLUENT model, enabling the calculation of heat transfer effects between solid and fluid components. The main section of the active panel is composed of a small diameter tube clamped between two metal sheets as main absorber. The backside is insulated, and one opposite metal layer closes the sandwich configuration. All models were performed at “steady state” under different working conditions varying the solar radiation intensity levels, modelled as “heat flux”, that means, the heat absorbed by the exposed surface of the collector is equal to the solar irradiance and the absorptance of the surface. Furthermore, heat is subsequently lost to the surroundings by natural and forced convection, from the surrounding air and from the wind respectively.

Models were validated for 2 and 6 panels of the active solar thermal façade for some different days along the year 2017. Additionally, the PMAE was calculated for all cases in order to quantify the validation error. Outlet fluid temperatures and a daily efficiency are predicted for representative average days in different annual season’s varying temperature, irradiance and wind speed. As a result, sheet and pipe conductivities, as well as solar absorptance, are highlighted as key performance parameters which can improve the efficiency of the collector.

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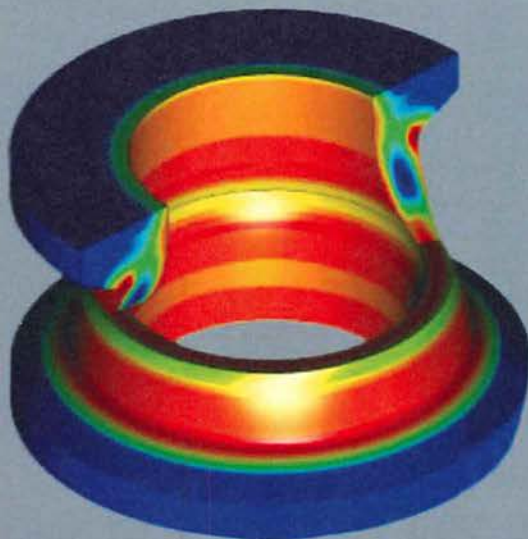
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We confirm that

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