

CANCAM 2019

27th Canadian Congress of Applied Mechanics

May 27-30, 2019 | Sherbrooke (QC), Canada



UNIVERSITÉ DE
SHERBROOKE



Symposium on energy efficiency in buildings and industry

May 28, 2019 at Université de Sherbrooke

Symposium Chairs: Sergio Croquer and Junior Lagrandeur (Université de Sherbrooke)

Keynote speaker: Ian Beausoleil-Morrison, PhD, P.Eng. (Carleton University)

The most recent reports expect average global temperatures to increase by about 1.5 °C over pre-industrial levels by year 2040, making climate change one of the most challenging problems presently faced by mankind. Moreover, as density population and energy intensity in urban areas grow at an elevated pace, the energy performances of buildings and industries are key components for addressing climate change and sustainable development, with policies already in place in developed countries to promote the construction of near-zero energy buildings and industrial processes with low environmental impacts.

Since most greenhouse gas emissions come from to combustion of fossil fuels, reducing energy consumption by making a more efficient use of resources is a key approach for reducing global emissions. This symposium focuses on discussing solutions for improving the energy efficiency in the context of both buildings and industrial applications. Special attention will be given to contributions including elements of fluid mechanics (air, water, refrigerant, combustion) or describing the thermodynamics and economics of potential applications of these systems. Below is a non-exhaustive list of potential subjects:



- Building energy simulation;
- Refrigeration cycles;
- Refrigeration equipment (compressors, ejectors, vortex tubes, heat pumps, etc.);
- Efficient air distribution and ventilation (air curtain, natural ventilation, cooling using outside air, etc.);
- Process optimization involving fluid mechanics;
- Solar thermal systems for heating or cooling;
- Combined heating and power systems;
- Advanced experimental or numerical methods dedicated to thermal energy systems

This symposium will conclude with a round table of Canadian experts about prospects and challenges in research on energy efficiency in Canada.

Please visit: <http://cancam2019.evenement.usherbrooke.ca/symposium.html>

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Providing high solar fractions for space and water heating in cold climates through seasonal storage

Prof. Ian Beausoleil-Morrison

Keynote, Symposium on Energy Efficiency,

28th of May 2019, CANCAM 2019, Université de Sherbrooke

Heating, cooling, and ventilating the places we live in, and providing the hot water, lighting, and appliance services we need, consumes tremendous amounts of energy; this contributes significantly to environmental and energy security issues. For example, housing accounts for 30% of all electricity and 26% of all natural gas consumed in Canada, and produces 13.5% of the country's greenhouse gas emissions. In most cool and cold climates, space and water heating account for the majority of the energy demand in housing, and therefore offer the greatest potential for savings. If locally available solar energy could be exploited then the majority of these energy demands could be met in an environmentally benign manner. However, this is complicated by the strong seasonal mismatch between solar availability and space-heating needs---approximately 70% of the solar energy resource is available outside the principle space-heating period. This talk will introduce the concept of the seasonal storage of solar energy at the single-house scale and will present ongoing research at Carleton University aimed at devising and evaluating methods for providing the majority of space and water heating needs (>90%) through solar energy. It will first provide some context by explaining the Canadian energy situation and current housing construction practices. A simulation-based analysis of a solar thermal system employing seasonal storage will then be presented, followed by a description of the design, construction, and commissioning of a full-scale research house. Finally, results from the first annual experiment conducted at the facility on the seasonal storage of solar thermal energy will be provided.



Ian Beausoleil-Morrison is a Professor in the Faculty of Engineering and Design at Carleton University in Ottawa, where he heads the Sustainable Building Energy Systems laboratory. He is co-founder and has been Co-Editor of the Journal of Building Performance Simulation since its establishment in 2008. He has been a Director of the International Building Performance Simulation Association (IBPSA) since 2004, and was Vice-President of that organization from 2006 to 2010, and President from 2010 to 2015. In 2015 he was awarded the grade of Fellow of IBPSA. He has been an Operating Agent for the International Energy Agency's Energy Conservation in Buildings Implementing Agreement. He is past Vice-Chair of ASHRAE's Technical Committee 4.7 on Energy Calculations, has been a Theme Leader of NSERC research networks on solar buildings, and is a member of the UK's Engineering and Physical Sciences Research Council Peer Review College. Prior to joining Carleton University in 2007, Professor Beausoleil-Morrison worked for 16 years at CanmetENERGY where he led a team of researchers who developed models for innovative energy systems such as micro-cogeneration and developed simulation tools for industry. His research interests include solar housing, seasonal thermal storage, micro-cogeneration, and understanding and controlling for occupant behaviour. Currently he is the Lead Investigator of the Urbandale Centre for Home Energy Research, a research house situated on the Carleton University campus that is dedicated to the long-term study of solar-thermal and other innovative energy systems for radically reducing the dependence of housing on fossil fuels and the electrical grid.

Symposium Chairs : Dr S. Croquer (Sergio.Croquer.Perez@USherbrooke.ca) & J. Lagrandeur (Junior.Lagrandeur@USherbrooke.ca)

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