

PROCEEDINGS OF

**The 60th SIMS Conference
on Simulation and Modelling
SIMS 2019**



Editors: Erik Dahlquist, Esko Juuso, Bernt Lie, and Lars Eriksson

Organized by Scandinavian Simulation Society (SIMS)

**Proceedings of
The 60th SIMS Conference on Simulation and Modelling
SIMS 2019**

Västerås, Sweden, 12 – 16 August 2019

Editors:

Erik Dahlquist, Esko Juuso, Bernt Lie, and Lars Eriksson

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Preface

The 60th SIMS conference on Simulation and Modelling (SIMS 2016) was held in cooperation with ICAE, 11th International Conference of Applied Energy in Västerås, Sweden. This was the 60th time for the conference SIMS. It was held the first time 1959, also in Vasteras, so this was a nice anniversary. Västerås is a city in Central Sweden on the shore of Lake Mälaren in the province of Västmanland, 100 kilometers west of Stockholm. The city has a population of approximately 120 000 out of the municipal total of 150 000.

The conference was held together with ICAE 2019 and thus the first day we had joint keynote speeches. Esko Juuso (Chairman six years before Erik) and Erik Dahlquist (Chairman SIMS last six years) had a presentation to all participants (800+) and the presentation is attached in the proceedings as well. It gives a bit of the history.

The Scandinavian Simulation Society consists of members from five Nordic countries: Denmark, Finland, Norway, Sweden, and Iceland. The goal of SIMS is to further develop the science and practice of modelling and simulation in all application areas and to be a forum for information interchange between professionals and non-professionals in the Nordic countries. SIMS is a member society of The Federation of European Simulation Societies (EUROSIM) was set up in 1989. The purpose of EUROSIM is to provide a European forum for regional and national simulation societies to promote the advancement of modelling and simulation in industry, research and development. EUROSIM consists of 17 European Simulation Societies. The Scandinavian simulation society (SIMS) had Board and Annual Meetings during the conference. The six-year period of Prof. Erik Dahlquist as the SIMS Chairman ended and Prof. Bernt Lie was elected as the new Chairman.

The SIMS 60 conference covered broad aspects of simulation, modeling and optimization in engineering applications, including many papers on bioprocesses, buildings, and electricity. Bioprocess cases cover biomass, biogas, anaerobic digestion, fed-batch fermentation, biofilm reactors, wastewater treatment, and waste conversion. Energy papers focus on buildings, including energy management, distributed power generation, thermal behavior, energy storage, occupation, and solar energy, and electricity focusing on synchronous generators, lighting, district heating, and power transmission. Several papers discuss fluidized beds in biomass gasification. Applications include also oil production, drilling, erosion, anti-icing, underground mining, and maintenance management. Cases utilize versatile methodologies, e.g. multivariate regression, parameter estimation, Kalman filters, and computational fluid dynamics, enhanced with uncertainty handling, intelligent systems, machine learning, digital twins, model predictive control, and early diagnostics. Modelling and simulation tools include Aspen HYSYS, Aspen Plus, Delphi, Dialux, Julia, OLGA, OpenModelica, MATLAB, ROCX, and Visual MINTEQ.

Panel discussions were organised on future directions of SIMS. The technical tours covered heat and power, water, wastewater, waste collection, and recycling. Industrial and environmental applications, development of modelling and simulation tools and strong support for PhD students continue for stimulating process development model-based automation.

We would like to express our sincere thanks to the keynote speakers, authors, session chairs, members of the program committee and additional reviewers who made this conference such an outstanding success. Finally, we hope that you will find the proceedings to be a valuable resource in your professional, research, and educational activities whether you are a student, academic, researcher, or a practicing professional.

Erik Dahlquist, Esko Juuso, Bernt Lie, and Lars Eriksson

Conferences location

The main venues were the Aros Congress Center and Mälardalen University in the City of Västerås.

Opening Ceremony, 13 August 2019

Welcome by the Governor Minoo Akhtarzand, The Province of Västmanland

Opening of the 11th International Conference on Applied Energy (ICAE2019)

- Prof. Xiaoxin Zhou, Editor-in-Chief of CSEE JPES
- Prof. Jinyue Yan, Editor-in-Chief of Applied Energy

Opening of the 60th International Conference of Scandinavian Simulation Society (SIMS): SIMS 60 years

- SIMS Chairman, Prof. Erik Dahlquist, Mälardalen University, Sweden
- Dr. Esko Juuso, University of Oulu, Finland

Keynote presentations (ICAE2019), 13 August 2019

How process automation is making the world more resource and energy efficient – future trends

Björn Jonsson, Head of Industrial Automation Division, and HUB Manager Control Technologies Northern Europe, ABB AB, Sweden

Understanding Building Energy Data, a key to a More Equitable Energy Transition – Impacts of and on Urban Development and Digitalisation

Prof. Stephanie Pincetl, Founding Director Center for Sustainable Communities, Institute of the Environment and Sustainability, UCLA, USA

What do we know about the global negative emissions energy system – 2050+

Dr. Michael Obersteiner, Program Director of the Ecosystems Services and Management Program, International Institute for Applied Systems Analysis, Austria

SIMS 60 Years, 13 August 2019

SIMS History and Future

*Esko K. Juuso, University of Oulu, Finland,
Erik Dahlquist, Mälardalen University, Sweden*

Greetings from Federation of European Simulation Societies - Eurosim

Dr. Miguel Mujica Mota, Eurosim President

General discussion about future directions of SIMS

Conference topics, 13 - 15 August 2019

Control (pp. 1-35)

Buildings (pp. 36-66)

Measurement and properties (pp. 67-90)

Oil production (pp. 91-105)

Bioprocesses (pp. 106-157)

Fluidized beds (pp. 158-189)

Electrical applications (pp. 190-228)

Maintenance (pp. 229-235)

Panel discussion on Future Directions of SIMS, 14 August 2019

Chairs: Esko K. Juuso, University of Oulu, Finland

Erik Dahlquist, Mälardalen University, Sweden

Technical tours, 16 August 2019

Eskilstuna Energy and Environment is handling everything related to heat and power, tap water and wastewater treatment as well as waste collection, sorting and recycling for the cities Eskilstuna and Strängnäs, and for household waste also for Örebro.

VafabMiljö works with sustainable and environmentally sound handling of waste, and is owned by the municipalities in Västmanland County together with municipalities Heby and Enköping. The population of the region is about 330 000, and there are more than 10 000 businesses that generate waste.

Social program

Conference Banquet, Aros Congress Center, 14 August 2019

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Prof. Erik Dahlquist, Malardalen University, Sweden

International Program Committee

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Assoc. Prof.	Evi	Zouganeli	Oslo Metropolitan University	Norway

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