

Date: Sunday, 22/May/2022

1:00pm - 4:00pm	SA_01: ASHRAE Course 01 - Fundamentals of Ultraviolet Germicidal Irradiation (UVGI) for Air and Surface Disinfection
Dock 12	Location: Dock 12 Paid course; you have to pre-register via ASHRAE website
1:00pm - 4:00pm	SA_02: ASHRAE Course 02 - Smart HVAC Solutions for Climate Design
Dock 15	Location: Dock 15 Paid course; you have to pre-register via ASHRAE website
1:00pm - 4:00pm	SR_01: REHVA Course 01 - In-Situ Monitoring of Transmission and Solar Heat Exchange Through Building Envelope
Dock 6	Location: Dock 6 Paid course; you have to pre-register via REHVA website
1:00pm - 4:00pm	SR_02: REHVA Course 02 - NZEB Design Strategies-Systems for Residential Buildings in Mediterranean Regions
Dock 7	Location: Dock 7 Paid course; you have to pre-register via REHVA website
1:30pm - 3:30pm	SR_GA: REHVA General Assembly
Dock 14	Location: Dock 14 upon invitation only
3:00pm - 5:00pm	Registration: Registration
Central	Location: Central Time reserved for registration at the conference site.
5:00pm - 7:30pm	SK1: Opening session + keynotes
Rotterdam A	Location: Rotterdam A Session Chair: Atze Boerstra Keynotes: Marianne Minnesma + Roland Bal
7:30pm - 9:00pm	Reception: Reception
Central	Location: Central

Date: Monday, 23/May/2022

8:30am - 10:00am	MK1: Keynotes 01 Health & Comfort + Discussion
Rotterdam A	Location: Rotterdam A Session Chair: Philomena M. Bluysen Session Chair: William P. Bahnfleth Presenter: Atze Boerstra Keynotes: Lidia Morawska and Arsen Melikov + Discussion COVID19
10:00am - 10:30am	MBr1: Break
Central	Location: Central
10:30am - 12:30pm	M1_01: Interactive session Monday 1_01 (Energy + H&C)
Rotterdam C	Location: Rotterdam C Session Chair: Catalin Lungu Workshop: Future ventilation solutions and indoor environment
10:30am - 12:30pm	M1_02: Interactive session Monday 1_02 (H&C)
Dock 15	Location: Dock 15 Session Chair: Panu Mustakallio Presenter: Kamal Moumen Presenter: Kim Harri Hagström Presenter: Piia Sormunen Theme sponsor (Halton): Safety in Indoor Settings
10:30am - 12:30pm	M1_03: Interactive session Monday 1_03 (Energy)
Dock 12	Location: Dock 12 Session Chair: Hilde Breesch Session Chair: Wim Maassen Presenter: Hilde Breesch Presenter: Louis Cony Presenter: Sandy Jorens Presenter: Eugene Mamulova 10:30-11:30: Seminar: "Towards Smart Ventilation" in Mid-sized buildings. 11:30-12:30: Seminar: Nearly Zero Energy Hospitals
10:30am - 12:30pm	M1_04: Interactive session Monday 1_04 (Digitization + H&C)
Dock 6	Location: Dock 6 Session Chair: Mirjam Harmelink Session Chair: Olivia Guerra-Santin Seminar: Smart buildings & interfaces for managers of buildings and facilities & Intelligence needed for occupant-HVAC interfaces at room level
10:30am - 12:30pm	

Dock 14	MA01: Parallel session Monday A01 (Energy) Location: Dock 14 Session Chair: Pieter-Jan Hoes
10:30am - 12:30pm Rotterdam D	MA02: Parallel session Monday A02 (Energy) Location: Rotterdam D Session Chair: Vojtěch Závřel
10:30am - 12:30pm Rotterdam A	MA03: Parallel session Monday A03 (Health & Comfort - Residential buildings) Location: Rotterdam A Session Chair: Marcel Loomans
10:30am - 12:30pm Rotterdam B	MA04: Parallel session Monday A04 (Health & Comfort - Self-reported health & comfort) Location: Rotterdam B Session Chair: Philomena M. Bluysen
10:30am - 12:30pm Dock 7	MA05: Parallel session Monday A05 (Digitization) Location: Dock 7 Session Chair: Paula Ida Van den Brom
10:30am - 5:00pm Dock 11	MR_01: REHVA student competition Location: Dock 11
12:30pm - 1:30pm Central	MLu: Lunch break Location: Central
1:30pm - 2:00pm Rotterdam A	MK2: Keynote 02 Health & Comfort Location: Rotterdam A Session Chair: Lada Hensen Centnerová Keynote: Ben van Berkel
2:00pm - 2:15pm	MTr1: Transfer time
2:15pm - 3:45pm Rotterdam C	M3_01: Interactive session Monday 3_01 (H&C) Location: Rotterdam C Session Chair: Jarek Kurnitski Session Chair: Atze Boerstra Presenter: Jarek Kurnitski Presenter: Pawel Wargocki Presenter: Amar Aganovic Workshop: COVID-19 implications on ventilation criteria and design
2:15pm - 3:45pm Dock 15	M3_02: Interactive session Monday 3_02 (H&C) Location: Dock 15 Main sponsor (Carrier): tbd
2:15pm - 3:45pm Dock 12	M3_03: Interactive session Monday 3_03 (Energy) Location: Dock 12 Session Chair: Karel Kabele Session Chair: Zuzana Veverková Presenter: Karel Kabele Presenter: Zuzana Veverková Energy performance and comfort of intelligent buildings - where is the limit of automation of building management processes?
2:15pm - 3:45pm Dock 6	M3_04: Interactive session Monday 3_04 (Digitization) Location: Dock 6 Session Chair: Gabriel Fierro Presenter: Gabriel Fierro Presenter: Pieter Pauwels Course: An Introduction to Semantic Metadata for Data-Driven Buildings.
2:15pm - 3:45pm Dock 14	MC01: Parallel session Monday C01 (Energy) Location: Dock 14 Session Chair: Fabian Ochs
2:15pm - 3:45pm Rotterdam D	MC02: Parallel session Monday C02 (Energy) Location: Rotterdam D Session Chair: Laure Itard
2:15pm - 3:45pm Rotterdam A	MC03: Parallel session Monday C03 (Health & Comfort - Infection risk) Location: Rotterdam A Session Chair: Marije te Kulve
2:15pm - 3:45pm Rotterdam B	MC04: Parallel session Monday C04 (Health & Comfort - Thermophysiology) Location: Rotterdam B Session Chair: Wouter David van Marken Lichtenbelt
2:15pm - 3:45pm	

Dock 7	MC05: Parallel session Monday C05 (Digitization) Location: Dock 7 Session Chair: Ongun Berk Kazanci
3:45pm - 4:15pm	MBr2: Break Location: Central
Central	
4:15pm - 5:45pm	M4_01: Interactive session Monday 4_01 (H&C) Location: Rotterdam C Session Chair: Risto Kosonen Session Chair: Arsen Krikor Melikov Presenter: Guangyu Cao workshop: Advanced airflow distribution methods for reduction of cross infection and exposure to indoor pollution.
Rotterdam C	
4:15pm - 5:45pm	M4_02: Interactive session Monday 4_02 (H&C) Location: Dock 12 Sponsor workshop (Belimo): 7 Essentials of Healthy Indoor Air
Dock 12	
4:15pm - 5:45pm	M4_04: Interactive session Monday 4_04 (Energy) Location: Dock 15 Session Chair: Peter van den Engel Session Chair: Susan Clare Roaf Seminar: Passive solutions.
Dock 15	
4:15pm - 5:45pm	MD01: Parallel session Monday D01 (Energy) Location: Dock 14 Session Chair: Rick Kramer
Dock 14	
4:15pm - 5:45pm	MD02: Parallel session Monday D02 (Energy) Location: Rotterdam D Session Chair: Arjan Frijns
Rotterdam D	
4:15pm - 5:45pm	MD03: Parallel session Monday D03 (Health & Comfort - Mitigation strategies for COVID-19) Location: Rotterdam A Session Chair: Jarek Kurnitski
Rotterdam A	
4:15pm - 5:45pm	MD04: Parallel session Monday D04 (Health & Comfort - IAQ assessment) Location: Rotterdam B Session Chair: Anne Sørensen
Rotterdam B	
4:15pm - 5:45pm	MD05: Parallel session Monday D05 (Digitization) Location: Dock 7 Session Chair: Gabriel Fierro
Dock 7	
Date: Tuesday, 24/May/2022	
8:30am - 9:15am	TK1: Keynote 01 Energy Location: Rotterdam A Session Chair: Jan Jaap Blüm Keynote: Pau Garcia Audi
Rotterdam A	
9:15am - 9:30am	TTr1: Transfer time
9:30am - 10:30am	T1_01: Interactive session Tuesday 1_01 (Energy) Location: Rotterdam C Theme sponsor (Daikin): tbd
Rotterdam C	
9:30am - 10:30am	T1_02: Interactive session Tuesday 1_02 (Energy) Location: Dock 15 Main sponsor (Carrier): tbd
Dock 15	
9:30am - 10:30am	T1_03: Interactive session Tuesday 1_03 (H&C) Location: Dock 11 Session Chair: Marcel Schweiker Session Chair: Brahim Mahfoud Presenter: Marcel Schweiker Presenter: Ardeshir Mahdavi Presenter: Andreas Wagner Discussion forum: How to assess multi-domain exposure situations in indoor environments? Discussing new research approaches for comfort and behavior
Dock 11	
9:30am - 10:30am	T1_04: Interactive session Tuesday 1_04 (L&E) Location: Dock 6 Session Chair: Christian Struck Session Chair: Laure Itard Seminar: Education & Learning in the HVAC sector: what's next? Session 1: sharing experiences with invited speakers from companies and educative bodies
Dock 6	
9:30am - 10:30am	TA01: Parallel session Tuesday A01 (Energy) Location: Rotterdam A Session Chair: Martin Tenpierik
Rotterdam A	

9:30am - 10:30am	TA02: Parallel session Tuesday A02 (Energy)
Rotterdam B	Location: Rotterdam B Session Chair: Tarlea Gratiela-Maria
9:30am - 10:30am	TA03: Parallel session Tuesday A03 (Health & Comfort - Monitoring and control)
Dock 14	Location: Dock 14 Session Chair: Marcel Loomans
9:30am - 10:30am	TA04: Parallel session Tuesday A04 (Health & Comfort - Cooking and other pollutants)
Rotterdam D	Location: Rotterdam D Session Chair: Risto Kosonen
9:30am - 10:30am	TA05: Parallel session Tuesday A05 (Digitization)
Dock 7	Location: Dock 7 Session Chair: Donal Finn
10:30am - 11:00am	TBr1: Break
Central	Location: Central
10:30am - 1:30pm	TR_01: REHVA Velux Healthy Homes Design Competition jury meeting
Port 7 ('Touwkamer')	Location: Port 7 ('Touwkamer') upon invitation only
11:00am - 12:30pm	T2_01: Interactive session Tuesday 2_01 (Energy)
Rotterdam C	Location: Rotterdam C Presenter: Alireza Zendejboudi Presenter: Jaume Salom Workshop: Trigeneration systems based on heat pumps with natural refrigerants and multiple renewable sources
11:00am - 12:30pm	T2_02: Interactive session Tuesday 2_02 (L&E + Energy)
Dock 15	Location: Dock 15 Session Chair: Andrei-Vladimir Lițiu Session Chair: Catalin Lungu Workshop: CEN-CE scheme roll-out: harmonised training and certification of experts on EPB standards
11:00am - 12:30pm	T2_03: Interactive session Tuesday 2_03 (H&C)
Dock 11	Location: Dock 11 Session Chair: Runa T. Hellwig Session Chair: Andreas Wagner Presenter: Runa T. Hellwig Presenter: Andreas Wagner Presenter: Fatih Topak Presenter: Romana Markovic Discussion forum: Accounting for occupants in building design and operation
11:00am - 12:30pm	T2_04: Interactive session Tuesday 2_04 (L&E)
Dock 6	Location: Dock 6 Session Chair: Ivo Marko Martinac Session Chair: Christian Struck Seminar: Education & Learning in the HVAC sector: what's next? Session 2: shaping the future: blue print for professional continuous education
11:00am - 12:30pm	TB01: Parallel session Tuesday B01 (Energy)
Rotterdam A	Location: Rotterdam A Session Chair: Regina Bokel
11:00am - 12:30pm	TB02: Parallel session Tuesday B02 (Energy)
Rotterdam B	Location: Rotterdam B Session Chair: Jan Jaap Blüm
11:00am - 12:30pm	TB03: Parallel session Tuesday B03 (Health & Comfort - Cooling systems)
Dock 14	Location: Dock 14 Session Chair: Gongsheng Huang
11:00am - 12:30pm	TB04: Parallel session Tuesday B04 (Health & Comfort - Offices)
Rotterdam D	Location: Rotterdam D Session Chair: Peter Holzer
11:00am - 12:30pm	TB05: Parallel session Tuesday B05 (Circularity)
Dock 7	Location: Dock 7 Session Chair: Olaf Oosting
12:30pm - 1:30pm	TLu: Lunch break
Central	Location: Central
1:30pm - 2:00pm	TK2: Keynote 02 Energy
Rotterdam A	Location: Rotterdam A Session Chair: Laure Itard Keynote: Lieve Helsen
2:00pm - 2:15pm	TTr2: Transfer time

2:00pm - 5:00pm	TR_02: HVAC World Student Competition
Dock 12	Location: Dock 12
2:15pm - 3:45pm	T3_01: Interactive session Tuesday 3_01 (Energy)
Rotterdam C	Location: Rotterdam C Presenter: Ivo Marko Martinac Workshop: Impact of the EU Taxonomy on Building Projects – Bridging the gap with financial actors
2:15pm - 3:45pm	T3_02: Interactive session Tuesday 3_02 (Energy)
Dock 6	Location: Dock 6 Presenter: Jarek Kurnitski Presenter: Michele De Carli Sponsor workshop: Deep Renovation Concepts
2:15pm - 3:45pm	T3_03: Interactive session Tuesday 3_03 (H&C)
Dock 11	Location: Dock 11 Session Chair: Peter Holzer Session Chair: Shady Attia Presenter: Peter Holzer Seminar: IEA EBC Annex 80 - Resilient Cooling in Buildings
2:15pm - 3:45pm	T3_04: Interactive session Tuesday 3_04 (H&C)
Dock 15	Location: Dock 15 Session Chair: Pawel Wargocki Workshop: Low relative humidity in indoor air – an important element of indoor air quality
2:15pm - 3:45pm	TC01: Parallel session Tuesday C01 (Energy)
Rotterdam A	Location: Rotterdam A Session Chair: Livio Mazzarella
2:15pm - 3:45pm	TC02: Parallel session Tuesday C02 (Energy)
Rotterdam B	Location: Rotterdam B Session Chair: Ardeshir Mahdavi
2:15pm - 3:45pm	TC03: Parallel session Tuesday C03 (Health & Comfort - Personal ventilation)
Dock 14	Location: Dock 14 Session Chair: Petr Zelensky
2:15pm - 3:45pm	TC04: Parallel session Tuesday C04 (Health & Comfort - IEQ and energy efficient retrofit)
Rotterdam D	Location: Rotterdam D Session Chair: Bas Hasselaar
2:15pm - 3:45pm	TC05: Parallel session Tuesday C05 (Learning & Education)
Dock 7	Location: Dock 7 Session Chair: Christian Struck
3:45pm - 4:15pm	TBr2: Break
Central	Location: Central
4:15pm - 5:45pm	T4_01: Interactive session Tuesday 4_01 (Energy)
Rotterdam C	Location: Rotterdam C Workshop: Support, consultancy and services for the implementation and practical use of the set of Energy Performance of Buildings standards
4:15pm - 5:45pm	T4_02: Interactive session Tuesday 4_02 (Energy)
Dock 15	Location: Dock 15 Session Chair: Tomasz Cholewa Session Chair: Ilinca Nastase Presenter: Jarek Kurnitski Presenter: Marija S. Todorovic Presenter: Tomasz Cholewa Presenter: Ilinca Nastase Workshop: Deep energy renovation of buildings for HVAC professionals.
4:15pm - 5:45pm	T4_03: Interactive session Tuesday 4_03 (H&C)
Dock 11	Location: Dock 11 Session Chair: Ongun Berk Kazanci Presenter: Ongun Berk Kazanci Presenter: Mariya Petrova Bivolarova Seminar: New IEA EBC Annex on Personalized Environmental Control Systems (PECS)
4:15pm - 5:45pm	TD01: Parallel session Tuesday D01 (Energy)
Rotterdam A	Location: Rotterdam A Session Chair: Marcel Loomans
4:15pm - 5:45pm	TD02: Parallel session Tuesday D02 (Energy)
Rotterdam B	Location: Rotterdam B Session Chair: Karel Kabele
4:15pm - 5:45pm	TD03: Parallel session Tuesday D03 (Health & Comfort - Modelling thermal comfort and overheating)
Dock 14	

	Location: Dock 14 Session Chair: Lada Hensen Centnerová
4:15pm - 5:45pm Rotterdam D	TD04: Parallel session Tuesday D04 (Health & Comfort - Thermal perception) Location: Rotterdam D Session Chair: Marcel Schweiker
4:15pm - 5:45pm Dock 7	TD05: Parallel session Tuesday D05 (Digitization) Location: Dock 7 Session Chair: Lieve Maria Helsen
4:15pm - 5:45pm Dock 6	TD06: Parallel session Tuesday D06 (Learning & Education) Location: Dock 6 Session Chair: Roel Loonen
Date: Wednesday, 25/May/2022	
8:30am - 9:15am Rotterdam A	WK1: Keynote 01 Digitization Location: Rotterdam A Session Chair: Pieter Pauwels Keynote: Clayton Miller
9:15am - 9:30am	WTr1: Transfer time
9:30am - 10:30am Rotterdam C	W1_01: Interactive session Wednesday 1_01 (Digitization) Location: Rotterdam C Theme sponsor (Siemens): tbd
9:30am - 10:30am Dock 15	W1_02: Interactive session Wednesday 1_02 (Digitization) Location: Dock 15 Main sponsor (Carrier): tbd
9:30am - 10:30am Rotterdam A	W1_03: Interactive session Wednesday 1_03 (Circularity) Location: Rotterdam A Session Chair: Bob Geldermans Session Chair: Tillmann Klein Presenter: Olaf Oosting Course: Masterclass circularity
9:30am - 10:30am Dock 12	W1_04: Interactive session Wednesday 1_04 (H&C) Location: Dock 12 Session Chair: Pawel Wargocki Session Chair: Jelle Laverge Presenter: Pawel Wargocki Presenter: Jelle Laverge Presenter: Marcel Loomans Seminar: Bedroom ventilation & sleep quality
9:30am - 10:30am Rotterdam B	WA01: Parallel session Wednesday A01 (Energy) Location: Rotterdam B Session Chair: Roel Loonen
9:30am - 10:30am Dock 14	WA02: Parallel session Wednesday A02 (Energy) Location: Dock 14 Session Chair: Christian Struck
9:30am - 10:30am Rotterdam D	WA03: Parallel session Wednesday A03 (Health & Comfort - Schools I) Location: Rotterdam D Session Chair: Wim Zeiler
9:30am - 10:30am Dock 7	WA04: Parallel session Wednesday A04 (Health & Comfort - CFD and building simulation) Location: Dock 7 Session Chair: Arjen Meijer
9:30am - 10:30am Dock 11	WA05: Parallel session Wednesday A05 (Digitization) Location: Dock 11 Session Chair: Christian Anker Hviid
10:30am - 11:00am Central	WBr1: Break Location: Central
11:00am - 12:30pm Rotterdam C	W2_01: Interactive session Wednesday 2_01 (Digitization) Location: Rotterdam C Presenter: Jan Cromwijk Workshop: Digital transformation facilitating building performance convergence and enabling operational rating
11:00am - 12:30pm Dock 15	W2_02: Interactive session Wednesday 2_02 (Digitization) Location: Dock 15 Sponsor workshop: The Future of HVAC as a Service
11:00am - 12:30pm	

Dock 6	W2_03: Interactive session Wednesday 2_03 (Digitization) Location: Dock 6 Sponsor workshop: Efficiency beyond the building: the leverage of advanced HVAC control systems in the management of Energy Communities.
11:00am - 12:30pm	W2_04: Interactive session Wednesday 2_04 (Circularity) Location: Rotterdam A Session Chair: Bob Geldermans Session Chair: Tillmann Klein Presenter: Olaf Oosting Course: Masterclass circularity
11:00am - 12:30pm	WB01: Parallel session Wednesday B01 (Energy) Location: Rotterdam B Session Chair: Wim Maassen
11:00am - 12:30pm	WB02: Parallel session Wednesday B02 (Energy) Location: Dock 14 Session Chair: Jaap Hogeling
11:00am - 12:30pm	WB03: Parallel session Wednesday B03 (Health & Comfort - Schools II) Location: Rotterdam D Session Chair: Dadi Zhang
11:00am - 12:30pm	WB04: Parallel session Wednesday B04 (Health & Comfort - Sleep quality) Location: Dock 7 Session Chair: Chenxi Liao
11:00am - 12:30pm	WB05: Parallel session Wednesday B05 (Digitization) Location: Dock 11 Session Chair: Pieter-Jan Hoes
11:00am - 12:30pm	WB06: Parallel session Wednesday B06 (Digitization) Location: Dock 12 Session Chair: Stijn Verbeke
12:30pm - 1:30pm	WLu: Lunch break Location: Central
1:30pm - 2:00pm	WK2: Keynote 02 Circularity Location: Rotterdam A Session Chair: Tillmann Klein Keynote: Thomas Auer
2:00pm - 3:30pm	WCI: Closing ceremony Location: Rotterdam A Session Chair: Atze Boerstra

MA01: Parallel session Monday A01 (Energy)

Time: Monday, 23/May/2022: 10:30am - 12:30pm · Location: Dock 14

Session Chair: Pieter-Jan Hoes

10:30am - 10:42am

Room-side and Plenum-side Cooling Prediction of Suspended Radiant Ceiling Panels

Jun Shinoda¹, Ongun B. Kazanci¹, Shin-ichi Tanabe², Katsuaki Hidari³, Hiroki Watanabe³, Yoshimi Takahashi³

¹Technical University of Denmark; ²Waseda University; ³Takenaka Corporation

10:42am - 10:54am

TEWI and energy assessment of integrated CO2 refrigeration, heating and cooling technology

Nishant Karve, Kris Van de Velde, Stefan Vandaele

Daikin Europe N.V., Belgium

10:54am - 11:06am

Textile-based heat exchanger for humidity recovery between spatially separated air flows

Hannes Rosenbaum, Christian Friebe

ILK Dresden, Germany

11:06am - 11:18am

Design of highly compact indirect evaporative coolers

Francisco Comino¹, Jesús Castillo-González², Francisco J. Navas-Martos², Pablo E. Romero¹, Manuel Ruiz de Adana³

¹Departamento de Mecánica, Escuela Politécnica Superior, Universidad de Córdoba, Campus de Rabanales, Antigua Carretera Nacional IV, km 396, 14071 Córdoba, Spain.; ²Centro Tecnológico del Plástico Andaltec, Calle Vilches 34, Ampliación Polígono Cañada de la Fuente, 23600 Martos Jaén, Spain.; ³Departamento de Química-Física y Termodinámica Aplicada, Escuela Politécnica Superior, Universidad de Córdoba, Campus de Rabanales, Antigua Carretera Nacional IV, km 396, 14071 Córdoba, Spain.

11:18am - 11:30am

Experimental assessment of thermal effectiveness of a regenerative indirect evaporative cooler

María Jesús Romero-Lara¹, Francisco Comino², Manuel Ruiz de Adana¹

¹Departamento de Química-Física y Termodinámica Aplicada, Escuela Politécnica Superior, Universidad de Córdoba, Campus de Rabanales, Antigua Carretera Nacional IV, km 396, 14071 Córdoba (Spain); ²Departamento de Mecánica, Escuela Politécnica Superior, Universidad de Córdoba, Campus de Rabanales, Antigua Carretera Nacional IV, km 396, 14071 Córdoba (Spain)

11:30am - 11:42am

Experimental Investigation of PCM System Improved with Nighttime Ventilation for Enhanced Solidification

Eva Zavr^{1,2}, Mohamed El Mankibi³, Mateja Dovjak⁴, Uroš Stritih¹

¹Faculty of Mechanical Engineering, University of Ljubljana, Ljubljana, Slovenia; ²Institute for Innovation and Development of University of Ljubljana, Ljubljana, Slovenia; ³National School of State Public Works (ENTPE), Vaulx-en-Velin, France; ⁴Faculty of Civil and Geodetic Engineering, University of Ljubljana, Ljubljana, Slovenia

11:42am - 11:54am

Sizing a collective heat pump system in an apartment building: impact of occupancy profiles

Matthias Criel^{1,2}, Maarten Sourbron², Hilde Breesch¹

¹KU Leuven, Department of Civil Engineering, Building Physics and Sustainable Design, Ghent, Belgium; ²Thermiek cvba

11:54am - 12:06pm

Analysis of Internal Leakages of Residential Ventilation Units by various test methods

Marie-Teres Moser¹, Anneli Halfvardsson², Jaroslav Chlup³, Heinrich Huber¹

¹HOCHSCHULE LUZERN, Switzerland; ²Flexit AS, Norway; ³2VV s.r.o., Czech Republic

12:06pm - 12:18pm

Characterization of a Constant Air Volume (CAV) Box Based on Measurements

Zakarya Kabbara, Sandy Jorens, Bert Belmans, Ivan Verhaert

University of Antwerp, Belgium

MA02: Parallel session Monday A02 (Energy)

Time: Monday, 23/May/2022: 10:30am - 12:30pm · Location: Rotterdam D
Session Chair: Vojtěch Zavřel

10:30am - 10:42am

Innovative heating and cooling systems based on caloric effects: A review

Hicham Johra¹, Christian Bahl²

¹Aalborg University, Denmark; ²Technical University of Denmark, Denmark

10:42am - 10:54am

Potential assessment of coupling PV electricity with district heating supply of building

Paul Seidel, Martin Altenburger, Joachim Seifert, Marta Sophia Potyka

TU Dresden, Germany

10:54am - 11:06am

Heath Recovery from Waste Recreational Pools Water of Thermal Baths and Medical Sanatoriums

Anna Predajnianska, Ján Takács

Slovak University of Technology in Bratislava, Faculty of Civil Engineering, Slovak Republic

11:06am - 11:18am

Development of Heat Recovery Radiant Heating System using Dynamic Insulation

Jaeung Hwang¹, Sihwan Lee²

¹SHINSHU UNIVERSITY, Japan; ²Nagoya University, Japan

11:18am - 11:30am

Insights of the DYDAS Project: The Use Case Energy

Ilaria Abbà¹, Cristina Becchio¹, Stefano Paolo Corgnati¹, Paolo Pasquali², Maria Cristina Pinto³, Elena Roglia⁴, Sara Viazzo¹

¹TEBE-IEEM Research Group, Energy Department, Politecnico di Torino, Torino, Italy; ²LINKS Foundation, Torino, Italy; ³TEBE-IEEM Research Group, Interuniversity Department of Regional and Urban Studies and Planning, Politecnico di Torino, Torino, Italy;

⁴SDG11lab, Interuniversity Department of Regional and Urban Studies and Planning, Politecnico di Torino, Torino, Italy

11:30am - 11:42am

Repeated solar regeneration of a medium-term heat storage for a heat pump

Annemarie Lauffer, Christian Schweigler

HM Hochschule München University of Applied Sciences, CENERGIE - Center for Energy-Efficient Buildings and Districts

11:42am - 11:54am

Impact of the Weather Forecast Quality on a MPCdriven Heat Pump Heating System

Sebastian Hummel, Christina Betzold, Arno Dentel

Technische Hochschule Nürnberg Georg Simon Ohm, Germany

11:54am - 12:06pm

Hardware-in-the-loop heat pump model validation for flexibility evaluations

Maarten Evens^{1,2}, Alessia Arteconi^{1,2,3}

¹KU Leuven, Belgium; ²EnergyVille, Belgium; ³Università Politecnica delle Marche, Italy

12:06pm - 12:18pm

Experiment-based testing routine to characterize building energy flexibility for potential aggregators

Vojtech Zavřel¹, Jakub Šimek¹, Tomáš Baumelt², Vladislav Martinek², Artem Mishukov³, Martin Bartak¹

¹Czech Technical University in Prague, Faculty of Mechanical Engineering, Czech Republic; ²Czech Technical University in Prague, University Centre for Energy Efficient Buildings; ³Elpramo s.r.o

MA03: Parallel session Monday A03 (Health & Comfort - Residential buildings)

Time: Monday, 23/May/2022: 10:30am - 12:30pm · Location: Rotterdam A
Session Chair: Marcel Loomans

10:30am - 10:42am

Recognition and Analysis of Air-conditioner Operation Based on Basic IAQ-monitoring

Yuanchen Wang, Florian Frey, Dirk Schwede, Konstantinos Stergiaropoulos

University of Stuttgart, Institute for Building Energetics, Thermotechnology and Energy Storage (IGTE)

10:42am - 10:54am

Health and energy assessment of a demand controlled mechanical extraction ventilation system

Janneke Ghijsels¹, Klaas De Jonge^{1,2}, Jelle Laverge¹

¹Department of Architecture and Urban Planning, Ghent University, Belgium; ²FWO - Flanders Research Foundation, Belgium

10:54am - 11:06am

Comparison of three residential ventilation systems in practical operation

Heinrich Huber, Alex Primas, Claudia Hauri

Hochschule Luzern, Switzerland

11:06am - 11:18am

Machine Learning Models for Indoor PM2.5 Concentrations in Residential Architecture in Taiwan

Yu Chen Lin¹, Yaw Shyan Tsay¹, Chien Chen Jung²

¹Department of Architecture, National Cheng Kung University, Tainan, Taiwan; ²Department of Public Health Assistant, China Medical University, Taichung, Taiwan

11:18am - 11:30am

Mostly dry: current ventilation practice efficiently limits moisture excess in mechanically ventilated

Salih Berkay Coskuntuna¹, Dimitrios Kraniotis¹, Siavash Barnoshian¹, Sverre Bjørn Holøs², Kari Thunshelle²

¹Dep. of Civil Engineering and Energy Technology, Oslo Metropolitan University, Oslo, Norway; ²Dep. of Architectural Engineering, SINTEF Community, Oslo, Norway

11:30am - 11:42am

Spatiotemporal humidity variation in student housing

Cathrine Hafnor², Sverre Holøs¹, Tormod Aurlien², Kari Thunshelle¹

¹SINTEF, Norway; ²Norwegian University of Life Sciences

11:42am - 11:54am

Effects of humidification process on the thermal behavior of floor heating systems

Tianying Li^{1,2}, Abdelatif Merabtine^{1,2}, Mohammed Lachi¹, Rachid Bennacer³

¹MATIM, Université de Reims Champagne-Ardenne, Reims, 51100, France; ²EPF Campus de Troyes, Troyes, 10000, France; ³LMT/ENS-Paris-Saclay/CNRS/Université Paris Saclay, Gif-sur-Yvette, 91190, France

11:54am - 12:06pm

A Study on the effect of the Wind Catcher in Apartment Buildings

Kotaro Ishikawa, Takashi Kurabuchi, Jeongil Kim

Tokyo University of Science, Japan

12:06pm - 12:18pm

Simulation of the effect of windcatchers on air quality inside courtyards

Hayder Murad Khan¹, Gregory Lane-Serff², Jonathan Dewsbury²

¹Sultan Qaboos university, Oman; ²the University of Manchester

12:18pm - 12:30pm

MITIGATING THE HIGH RADON CONCENTRATION IN EXISTING HOMES

Mares Ion-Costinel, Tiberiu Catalina

Technical University of Civil Engineering/ Faculty of Engineering Installations Bucharest, Romania

MA04: Parallel session Monday A04 (Health & Comfort - Self-reported health & comfort)

Time: Monday, 23/May/2022: 10:30am - 12:30pm · Location: Rotterdam B

Session Chair: Philomena M. Bluyssen

10:30am - 10:42am

Patterns and Profiles for understanding the indoor environment and its occupants

Philomena M. Bluyssen

Delft University of Technology, Netherlands, The

10:42am - 10:54am

The value of user feedback to improve the indoor environment in offices

Merlijn Huijbers¹, Marije te Kulve²

¹DGMR, Netherlands, The; ²bba binnenmilieu

10:54am - 11:06am

Investigation of the group differences in indoor environmental quality

Zheng Li^{1,2,3}, Ongun Berk Kazanci¹, Qingwen Zhang^{2,3}, Bjarne Wilkens Olesen¹

¹International Centre for Indoor Environment and Energy, Department of Environmental and Resource Engineering, Technical University of Denmark, Nils Koppels Allé, Building 402, 2800 Kgs. Lyngby, Denmark, hitlizheng@hotmail.com.; ²Key Lab of Structures Dynamic Behavior and Control of the Ministry of Education, Harbin Institute of Technology, Harbin, 150090, China, hitlizheng@hotmail.com.; ³Key Lab of Smart Prevention and Mitigation of Civil Engineering Disasters of the Ministry of Industry and Information Technology, Harbin Institute of Technology, Harbin, 150090, China, hitlizheng@hotmail.com.

11:06am - 11:18am

Office workers' health during the pandemic lockdown in the Netherlands

Marco Ortiz, Philomena Bluyssen

Delft University of Technology

11:18am - 11:30am

Students' self-reported health and psychosocial status at home before and during COVID-19

Amneh Hamida, Dadi Zhang, Marco A. Ortiz, Philomena M. Bluyssen

Faculty of Architecture and the Built Environment, Delft University of Technology

11:30am - 11:42am

Analysis of occupant satisfaction with IEQ in residential buildings

Quinten Carton¹, Jakub Kolarik², Hilde Breesch¹

¹KU Leuven, Belgium; ²Technical University of Denmark, Denmark

11:42am - 11:54am

Using HAIEQ methodology for holistic analysis of IEQ in modern family houses

Zuzana Veverková, Karel Kabele, Pavla Dvořáková

CTU in Prague, Czech Republic

11:54am - 12:06pm

Self-reported health and comfort of outpatient workers in six hospitals

Annemarie Eijkelenboom¹, Philomena Bluyssen²

¹EGM architects; ²Delft University of Technology

12:06pm - 12:18pm

Monitoring the indoor environment for older people with dementia: a lesson learned

Chuan Ma, Olivia Guerra-Santin, Anne Grave, Masi Mohammadi

Eindhoven University of Technology, the Netherlands

12:18pm - 12:30pm

Research, standards, practice: Necessary conditions for occupant-centric indoor environments

Christiane Berger¹, Veselina Bochukova², Ardeshir Mahdavi²

¹Aalborg University, Denmark; ²TU Wien, Austria

MA05: Parallel session Monday A05 (Digitization)

Time: Monday, 23/May/2022: 10:30am - 12:30pm · Location: Dock 7
Session Chair: Paula Ida Van den Brom

10:30am - 10:42am

Next generation energy performance assessment methods for EPCs using measured energy data

Jan Verheyen^{1,2}, Evi Lambie^{1,2}, Lukas Kranzl³, Maria Fernández Boneta⁴, Iná Maia³, Theresa Urbanz⁵, David Frick⁵

¹VITO, Belgium; ²EnergyVille, Belgium; ³TU Wien, Austria; ⁴CENER, Spain; ⁵EA-Stmk, Austria

10:42am - 10:54am

Detection of the low ΔT syndrome using machine learning models

Anand Thamban¹, Alet van den Brink², Shalika Walker¹, Wim Zeiler¹

¹Eindhoven University of Technology, The Netherlands; ²Kropman Installatietechniek B.V., The Netherlands

10:54am - 11:06am

Applying MTP-concept for the standardization of building automation and control systems

Michael Krüttgen, Prof. Dr. Jochen Müller

TH Köln - University of Applied Sciences, Institute of Building Services Engineering, Germany

11:06am - 11:18am

Building Assessment Framework from Whole Building to Components: A Danish Case Study

Kamilla Heimar Andersen¹, Simon Pommerencke Melgaard¹, Anna Marszal-Pomianowska¹, Thomas Fehr², Rasmus Lund Jensen¹, Per Kvols Heiselberg¹

¹Aalborg University, Denmark; ²FE-Partner AG, Switzerland

11:18am - 11:30am

Customized Neural Network training to predict the highly imbalanced data of domestic hot water usage

Caroline Risoud, Amirreza Heidari, Dolaana Khovalyg

Integrated Comfort Engineering (ICE), Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland

11:30am - 11:42am

Energy consumption characteristics based on monitored data: a school case study

Kristina Vassiljeva¹, Margarita Matson², Eduard Petlenkov^{1,4}, Juri Belikov^{2,4}, Martin Thalfeldt^{3,4}, Jarek Kurnitski^{3,4}

¹Department of Computer Systems, Tallinn University of Technology, Tallinn, Estonia; ²Department of Software Science, Tallinn University of Technology, Tallinn, Estonia; ³Department of Civil Engineering and Architecture, Tallinn University of Technology, Tallinn, Estonia; ⁴Smart City Centre of Excellence (Finest Twins)

11:42am - 11:54am

De-Risking Building Performance Investments by Certified Quality Management Services (QUEST)

Ivo Martinac^{1,2}, Stefan Plessner³, Cormac Ryan⁴, Han-Suck Song¹, Ole Teisen⁵, Jin Wen⁶

¹KTH Royal Institute of Technology, Stockholm, Sweden; ²REHVA, Brussels, Belgium; ³synavision GmbH, Bielefeld, Germany; ⁴COPILOT Building Commissioning Certification, Paris, France; ⁵Sweco Denmark, Copenhagen, Denmark; ⁶Drexel University, Philadelphia/PA, USA

11:54am - 12:06pm

Digital Twin for Heat Pump Systems - Description of a holistic approach consisting of numerical models and system platform

Joachim Seifert¹, Lars Haupt¹, Lars Schinke¹, Alf Perschk¹, Thomas Hackensellner², Stephan Wiemann¹, Martin Knorr¹

¹TU Dresden, Germany; ²Glen Dimplex, Germany

12:06pm - 12:18pm

Interoperability of semantically heterogeneous digital twins through Natural Language Processing methods

Maximilian Both¹, Alina Cartus¹, Nicolai Maisch¹, Jochen Müller¹, Christian Diedrich²

¹Technische Hochschule Köln, Germany; ²Otto-von-Guericke-Universität Magdeburg, Germany

12:18pm - 12:30pm

Increasing the Energy Flexibility of Buildings controlled by Model Predictive Control

Christian Karczewski, Tobias Henzler, Konstantinos Stergiaropoulos

University of Stuttgart, Germany

MC01: Parallel session Monday C01 (Energy)

Time: Monday, 23/May/2022: 2:15pm - 3:45pm · Location: Dock 14

Session Chair: Fabian Ochs

2:15pm - 2:27pm

Energy efficiency and indoor climate benefits of demand-based ventilation in simulated office rooms

Vili Kohtaniemi, Panu Mustakallio

Halton, Finland

2:27pm - 2:39pm

Laboratory test of commercial smart radiator thermostats when used for load shifting

Virginia Amato, Thea Hauge Broholt, Louise Rævdal Lund Christensen, Rasmus Elbæk Hedegaard, Michael Dahl Knudsen, Steffen Petersen

Aarhus University, Denmark

2:39pm - 2:51pm

Experimental investigation of the contaminated volume around a person in a clean room

Julia Carolin Lange, Yunus Emre Cetin, Martin Kriegel

Technische Universität Berlin, Germany

2:51pm - 3:03pm

Stratification and draught measurements of ceiling panels, underfloor cooling and fan-assisted radiators

Karl-Villem Võsa¹, Egert Eist¹, Jarek Kurnitski^{1,2}

¹Department of Civil Engineering and Architecture, Tallinn University of Technology, 19086 Tallinn, Estonia; ²Department of Civil Engineering, Aalto University, 00076 Aalto, Finland

3:03pm - 3:15pm

Investigation of additively manufactured triply periodic minimal surfaces as an air-to-air heat exchanger

Alper Mete Genc^{1,2}, Ceren Vatanser¹, Meltem Koçak², Ziya Haktan Karadeniz³

¹Graduate School of Natural and Applied Sciences, Izmir Kâtip Celebi University, Izmir, Turkey; ²ENEKO, Cigli, Izmir, Turkey;

³Department of Energy Systems Engineering, Izmir Institute of Technology, Izmir, Turkey

3:15pm - 3:27pm

Simplified CFD for pressure drop predictions in ducts

Thijs Van Druenen¹, Zakarya Kabbara², Ivan Verhaert², Twan van Hooff¹

¹Eindhoven University of Technology, Netherlands, The; ²University of Antwerp, Belgium

3:27pm - 3:30pm

Heat Pump Solutions in Renovations of Multi-Storey Buildings

Georgios Dermentzis¹, Mara Magni¹, William Monteleone¹, Benjamin Schaffer², Fabian Ochs¹

¹University of Innsbruck, Austria; ²TBH Ingenieure GmbH

3:30pm - 3:33pm

Nearly zero energy buildings with air-source heat pumps across Europe

László Zsolt Gergely¹, Zsuzsa Szalay², Tamás Csoknyai¹

¹Faculty of Mechanical Engineering, Department of Building Services and Process Engineering, Budapest University of Technology and Economics, Hungary; ²Faculty of Civil Engineering, Department of Construction Materials and Technologies, Budapest University of Technology and Economics, Hungary

3:33pm - 3:36pm

Extension of the Air Distribution Network Design Optimization algorithm: implementation of fittings

Sandy Jorens, Zakarya Kabbara, Ehsan Ahmadian, Ivan Verhaert

University of Antwerp, Belgium

3:36pm - 3:39pm

Impact of integration of electric and gas heat pumps on the final energy consumption of Belgian residential building stock

Essam Elnagar, Camila Davila, Vincent Lemort

3:39pm - 3:42pm Warning: The presentations finish prior to the end of the session!

Are bedroom air temperatures affected by temperature boosts in adjacent rooms?

Louise Rævdal Lund Christensen, Thea Hauge Broholt, Steffen Petersen

Aarhus university, Denmark

MC02: Parallel session Monday C02 (Energy)

Time: Monday, 23/May/2022: 2:15pm - 3:45pm · Location: Rotterdam D
Session Chair: Laure Itard

2:15pm - 2:27pm

Development and characterization of thermal insulation materials based on rice straw and natural binder

Yaping Zhou¹, Abdelkrim Trabelsi², Mohamed El Mankibi¹

¹Univ Lyon, ENTPE, LTDS, UMR5513, 69120 Vaulx-en-Velin, France; ²Univ Lyon, UCBL, INSA Lyon, CNRS, CETHIL, UMR5008, 69622 Villeurbanne, France

2:27pm - 2:39pm

Performance of a mixed-use ground source heat pump system in Stockholm

Jeffrey D. Spitler¹, Signhild Gehlin²

¹Oklahoma State University, United States of America; ²Swedish Geoenergy Center

2:39pm - 2:51pm

STUDY ON REPRODUCIBILITY OF EXHAUST DIFFUSION PROPERTIES OF GAS WATER HEATERS

Saki Nakano, Takashi Kurabuchi, Jeongil Kim

Tokyo University of Science, Japan

2:51pm - 3:03pm

Comparison and implementation of MPC and simple predictive control into a heat pump system

Christina Betzold, Arno Dentel

Technische Hochschule Nürnberg Georg Simon Ohm, Germany

3:03pm - 3:15pm

A decision-making methodology of decarbonization for a dwelling stock in France

Tianrui Ouyang, Richard Cantin, Mohamed El Mankibi, Pierre Michel

Entpe, France

3:15pm - 3:27pm

Study of bioclimatic shading strategies in Seville: Habitability in open public spaces

Teresa Rocio Palomo Amores, María del Carmen Guerrero Delgado, Daniel Castro Medina, Alberto Cerezo Narváez, José Sánchez Ramos, Servando Álvarez Domínguez

University of Seville, Spain

3:27pm - 3:30pm

From Diesel to Electric to NZEB, an Energy Performance Contract in a Hotel

Joao Raposo¹, Daniel Silva¹, Antonio Mortal², Joao Lopes²

¹AMAGO-ENERGIA INTELIGENTE, Portugal; ²Universidade do Algarve

3:30pm - 3:33pm

Design of Renewable Energy Production in District Heating System

Martina Mudrá, Ján Takács

Slovak University of Technology in Bratislava, Slovak Republic

3:33pm - 3:36pm

Design and optimal integration of seasonal borehole thermal energy storage in district heating and cooling networks

Massimo Fiorentini¹, Jacopo Vivian¹, Philipp Heer¹, Luca Baldini²

¹Urban Energy Systems Laboratory, Empa - Swiss Federal Laboratories for Materials Science and Technology, 8600 Dübendorf, Switzerland; ²ZHAW - Zurich University of Applied Sciences, 8401 Winterthur, Switzerland

3:36pm - 3:39pm

Upgrade of ice storage system in congress centre

Urška Mlakar, Uroš Stritih

University of Ljubljana, Faculty of Mechanical Engineering, Slovenia

3:39pm - 3:42pm

Measurement and statistical evaluation of hot water tapping profiles in (non-)residential buildings

Jonas Keuler, Paul Mühlenweg, Semiramez Mende, Sven-Yannick Schuba, Daniel Eggert, Peter Pärish

Institute for Solar Energy Research Hamelin, Emmerthal, Germany

3:42pm - 3:45pm

Renewable energy sources used for a low energy University building

Razvan Popescu, Lelia Popescu, Tiberiu Catalina

Technical University of Civil Engineering, Bucharest, ROMANIA

MC03: Parallel session Monday C03 (Health & Comfort - Infection risk)

Time: Monday, 23/May/2022: 2:15pm - 3:45pm · Location: Rotterdam A
Session Chair: Marije te Kulve

2:15pm - 2:27pm

Evaluation of preventive measures in mitigating the risk of airborne infection of COVID-19

Yunus Emre Cetin, Martin Kriegel
Technische Universität Berlin, Germany

2:27pm - 2:39pm

Development of a Non-contact Modular Screening Center (NCMSC) for COVID-19

Jinkyun Cho¹, Jinho Kim², Jongwoon Song³, Seungmin Jang¹

¹Hanbat National University, Korea, Republic of (South Korea); ²Suwon Science College, Korea, Republic of (South Korea); ³E-SOLTEC, Korea, Republic of (South Korea)

2:39pm - 2:51pm

Numerical investigation of the transmission route of infectious particles produced by human

Wonseok Oh¹, Ryoza Ooka¹, Hideki Kikumoto¹, Sihwan Lee²

¹Institute of Industrial Science, The University of Tokyo, Japan; ²Department of Architecture, Shinshu University, Japan

2:51pm - 3:03pm

Droplet Concentration Produced during Expiratory Activities and Evaluation of Relative Infection Risk

Arisu Furusawa, Takashi Kurabuchi, Jeongil Kim
Tokyo University of Science, Japan

3:03pm - 3:15pm

Aerosol transmission in rotary wheel heat exchangers

Heinrich Huber¹, Thomas Richter², Florian Brzezinski¹, Michael Riediker³

¹Hochschule Luzern, Horw, Switzerland; ²Hoval Aktiengesellschaft, Vaduz, Lichtenstein; ³SCOEH, Winterthur, Switzerland

3:15pm - 3:27pm

Safe indoor work-outs during the COVID-19 pandemic

Marije te Kulve¹, Francesco Franchimon², Vincent Vons³, Eliane Khoury³

¹bba binnenmilieu, Netherlands, The; ²Franchimon ICM, Netherlands, The; ³VFA Solutions, Netherlands, The

3:27pm - 3:30pm

Study on Ventilation Efficiency and Infection Probability in the Outbreak at Restaurant

Nobuhide Ashiki, Takashi Kurabuchi, Jeongil Kim
Tokyo University of Science, Japan

3:30pm - 3:33pm

Assessment of the infection risk distribution of COVID-19 and ventilation energy consumptions in indoor environments

Marco Marigo, Giacomo Tognon, Michele De Carli, Angelo Zarrella
Università degli Studi di Padova, Italy

MC04: Parallel session Monday C04 (Health & Comfort - Thermophysiology)

Time: Monday, 23/May/2022: 2:15pm - 3:45pm · Location: Rotterdam B

Session Chair: Wouter David van Marken Lichtenbelt

2:15pm - 2:27pm

2:27pm - 2:39pm

Dynamics of individuals' metabolic rate in a real office case study under thermoneutrality

Dolaana Khovalyg, Jiyoung Kwak

laboratory of Integrated Comfort Engineering (ICE), Ecole polytechnique fédérale de lausanne (EPFL), Lausanne, Switzerland

2:39pm - 2:51pm

Assessing Thermal Comfort in Nursing Home Using Heart Rate Measurement

Anne Sørensen, Steffen Petersen

Aarhus University, Denmark

2:51pm - 3:03pm

Effects of daytime cool vs warm exposure on evening thermal perception and thermoregulation

Hannah Pallubinsky^{1,2}, Rania Christoforou¹, Kai Rewitz³, Janine Bardey^{1,4}, Tobias Burgholz^{3,4}, Mahmoud Elmokadem³, Dirk Müller^{3,4}, Marcel Schweiker¹

¹Research and Teaching Area Healthy Living Spaces, Institute for Occupational, Social and Environmental Medicine, Medical Faculty, RWTH Aachen University, Germany; ²Department of Nutrition and Movement Sciences, School of Nutrition and Translational Metabolism Research (NUTRIM), Maastricht University, the Netherlands; ³Institute for Energy Efficient Buildings and Indoor Climate, E.ON Energy Research Center, RWTH Aachen University, Aachen, Germany; ⁴Heinz Trox Wissenschafts gGmbH, Aachen, Germany

3:03pm - 3:15pm

Human Body Cooling Effect of Local Non-Isothermal Airflow during Natural Ventilation

Yoshihide Yamamoto

Tokyo Polytechnic University, Japan

3:15pm - 3:27pm

Creating health and resilience by a dynamic indoor climate

Wouter David van Marken Lichtenbelt¹, Hannah Pallubinsky², Rick Kramer³

¹Maastricht University, Netherlands, The; ²Maastricht University, Netherlands, The, RWTH Aachen, Germany; ³Eindhoven University of Technology, Netherlands, The

3:27pm - 3:39pm

Productivity prediction via human physiological signals for an optimum thermal environment

Dongwoo Yeom¹, Taegeun Kim², Sung-Guk Yoon²

¹Arizona State University, United States of America; ²Soongsil University, Korea

3:39pm - 3:42pm

A review of thermal comfort modeling of elderly people

Minzhou Chen¹, Risto Kosonen^{1,2}, Simo Kilpelainen¹, Ru Ming³

¹Aalto University, Finland; ²Nanjing Tech University, China; ³Chongqing University, China

MC05: Parallel session Monday C05 (Digitization)

Time: Monday, 23/May/2022: 2:15pm - 3:45pm · Location: Dock 7

Session Chair: Ongun Berk Kazanci

2:15pm - 2:27pm

Digital system interaction test: quality assurance of system functions through standardized tests

Rebekka Benfer¹, Ralf Ulmer¹, Eike Hinck¹, Jochen Müller¹, Samuel Rischmüller², Stefan Plesser²

¹TH Köln - University of Applied Sciences, Cologne, Germany; ²synavision GmbH, Bielefeld, Germany

2:27pm - 2:39pm

Interoperable interactions of HVAC components based on a capability ontology

Nicolai Maisch, Maximilian Both, Ralf Ulmer, Jochen Müller

TH Köln – University of Applied Sciences, Germany

2:39pm - 2:51pm

Futureproofing and scaling machine learning for occupancy prediction

Davor Stjelja^{1,2}, Risto Kosonen^{2,3}, Juha Jokisalo²

¹Granlund, Finland; ²Aalto University; ³Nanjing Tech University

2:51pm - 3:03pm

Automated classification of HVAC systems through analysis of system behaviour

Björn Kämper, Maximilian Both, Nicolai Maisch, Jochen Müller

Cologne University of Applied Sciences

3:03pm - 3:15pm

Time Series Building Energy Systems Data Imputation

Adrien Lucbert¹, Juliën van der Niet², Albert Corson¹, Michael Weij², Ramon Isaac van der Elst², Jesús M^a Martínez de Juan³, Tadeo Baldiri Salcedo Rahola²

¹Epitech, France; ²The Hague University of Applied Sciences, The Netherlands; ³Francisco de Vitoria University, Spain

3:15pm - 3:27pm

Practical experiences from the implementation of extensive sensing in a modern building

Adam Bognar, Pieter-Jan Hoes, Twan A.J. van Hooff, Marcel G.L.C. Loomans

Eindhoven University of Technology, Netherlands, The

3:27pm - 3:39pm

Economic evaluation of properties based on consumption data

Rebekka Benfer, Jo Mathis Ihnenfeldt, Mathis Stange, Manuel Westerkowski

TH Köln - University of Applied Sciences Cologne, Germany

3:39pm - 3:42pm

Study on occupancy presence and heat use in a Norwegian office building

Lu Yan^{1,2}, Yuemin Ding³, Natasa Nord¹, Meng Liu²

¹Department of Energy and Process Engineering, Norwegian University of Science and Technology, Norway; ²School of Civil Engineering, Chongqing University, Chongqing, China; ³Tecnun School of Engineering, University of Navarra, Manuel Lardizabal Ibilbidea, 13, San Sebastian, Spain 20018

MD01: Parallel session Monday D01 (Energy)

Time: Monday, 23/May/2022: 4:15pm - 5:45pm · Location: Dock 14

Session Chair: Rick Kramer

4:15pm - 4:27pm

Self-adaptive dynamic indoor climate control for museums, archives and libraries. Vast energy savings at Hermitage Amsterdam museum

Rick Kramer^{1,2}, Marco Martens², Edgar Neuhaus²

¹Eindhoven University of Technology, The Netherlands; ²DYSECO B.V., The Netherlands

4:27pm - 4:39pm

Smart thermostatic valves based heat generator control to cut heating bills

Yves Stauffer, Max Boegli, Tomasz Gorecki, Nelson Koch, Renaud Langou, Andreas Hutter

CSEM, Switzerland

4:39pm - 4:51pm

Design and experiment study of membrane based isothermal dehumidifier in HVAC system

Seong-Yong Cheon, Hye-Jin Cho, Su-Young Jo, Jae-hee Lee, Minseong Kim, Jae-Weon Jeong

Hanyang University, Korea, Republic of (South Korea)

4:51pm - 5:03pm

Experimental investigation on a packaged unit of membrane dehumidification-based ventilation system

Hye-Jin Cho, Seong-Yong Cheon, Su-Young Jo, Soo-Jin Lee, Gyu-Bae Lee, Jae-Weon Jeong

Hanyang University, Korea, Republic of (South Korea)

5:03pm - 5:15pm

Predicting the waterside temperature difference of a cooling coil in part load

Alet Van Den Brink^{1,2}, Shalika Walker¹, Wim Zeiler¹

¹Eindhoven University of Technology, Netherlands, The; ²Kropman Installatietechniek B.V.

5:15pm - 5:27pm

Energy-saving and IAQ control in hospital patient room by bed-integrated ventilation

Zhiqi Wang, Mariya Petrova Bivolarova, Arsen Krikor Melikov

International Centre for Indoor Environment and Energy, Department of Civil Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark

5:27pm - 5:30pm

SunHorizon advanced control system and proactive maintenance tool: Case study in Latvia

Alejandro Martín-Crespo, Alejandro Hernández-Serrano, Roberto Aranz, Alberto Belda-González, Andrea Gabaldón Moreno

CARTIF Technology Centre, Spain

5:30pm - 5:33pm

Experimental study on a liquid desiccant dehumidifier with a solution atomization

Soo-Jin Lee, Hye-Jin Cho, Jae-Hee Lee, Yong-Kwon Kang, Gyu-Bae Lee, Jae-Weon Jeong

Hanyang University, Korea, Republic of (South Korea)

5:33pm - 5:36pm

Cooling Performance Evaluation of an Independent Modular Air Containment with Row-based Cooling System for Data Centers

Jinkyun Cho, Beungyong Park, Seungmin Jang

Hanbat National University, Korea, Republic of (South Korea)

5:36pm - 5:39pm

THERMISTOR NTC SENSOR INACCURACIES IMPACT ON THE HVAC/R COMPRESSOR PERFORMANCE

Adrian Anastase, Gratiela-Maria Tarlea

Technical University of Civil Engineering Bucharest, Romania

5:39pm - 5:42pm

Dynamic modeling and simulation of a centrifugal chiller based on MBSE

Yoonjei Hwang, Hanyoung Park, Kangwook Lee, Wansoo Kim, Jongsoo Kim, Yangsoo Lee, Saikee Oh
LG Electronics Inc., Korea, Republic of (South Korea)

5:42pm - 5:45pm

Analysis of the application of ventilative cooling in different regions of Turkey

Asli Birturk¹, Zeki Yilmazoglu²

¹Solar Energy Institute, Ege University, Izmir, Turkey; ²Gazi University, Dept. of Mechanical Engr., Ankara, Turkey

MD02: Parallel session Monday D02 (Energy)

Time: Monday, 23/May/2022: 4:15pm - 5:45pm · Location: Rotterdam D
Session Chair: Arjan Frijns

4:15pm - 4:27pm

Design and integration of innovative rehabilitation technique: Improving habitability in social housing
Teresa Rocio Palomo Amores, María del Carmen Guerrero Delgado, Daniel Castro Medina, José Luis Molina Félix, José Sánchez Ramos, Servando Álvarez Domínguez
University of Seville, Spain

4:27pm - 4:39pm

Design under uncertainty of solar hot water systems for hospitals
Antonio Atienza-Márquez, Fernando Domínguez Muñoz, Francisco Fernández Hernández, José Manuel Cejudo López
Universidad de Málaga, GEUMA – Energy Research Group, C/ Doctor Pedro Ortiz Ramos s/n, 29013 Málaga, Spain.

4:39pm - 4:51pm

Solar Cooling Integrated Façades: Main Challenges in Product Development for Widespread Application
Hamza Hamida¹, Thaleia Konstantinou¹, Alejandro Prieto², Tillmann Klein¹, Ulrich Knaack¹
¹Faculty of Architecture and the Built Environment, Delft University of Technology, Julianalaan 134, 2628BL Delft, The Netherlands
H; ²School of Architecture, Diego Portales University, República Av. 180, 8370074 Santiago, Chile

4:51pm - 5:03pm

Numerical analysis of ventilated windows' thermal behaviour under summer condition
Shiva Najaf Khosravi, Ardeshir Mahdavi
Vienna University of Technology, Vienna, Austria

5:03pm - 5:15pm

Individual EV load profiling and smart charging to flatten total electrical demand
Ward Somers¹, Waqas Khan¹, Kevin de Bont², Wim Zeiler^{1,2}
¹Technical University of Eindhoven, Netherlands, The; ²Kropman Installatietechniek B.V., Netherlands, The

5:15pm - 5:27pm

Identifying promising use cases for a novel heat battery in Dutch residential buildings
Shuwei Wang¹, Pieter-Jan Hoes¹, Jan L.M. Hensen¹, Olaf C.G. Adan^{2,3,4}, Pim A.J. Donkers⁴
¹Department of the Built Environment, Eindhoven University of Technology, Eindhoven, the Netherlands.; ²Department of Applied Physics, Eindhoven University of Technology, Eindhoven, The Netherlands.; ³TNO Materials Solutions, High Tech Campus 25, Eindhoven, the Netherlands.; ⁴Cellcius BV, Horsten 1, Eindhoven, the Netherlands.

5:27pm - 5:30pm

Integration of an innovative dual day-night technique for air conditioning of public spaces
Daniel Castro Medina, María del Carmen Guerrero Delgado, Teresa Rocio Palomo Amores, Rocío González Falcón, José Sánchez Ramos, Servando Álvarez Domínguez
University of Seville, Spain

5:30pm - 5:33pm

Analysis of heat storage using Phase change material
Uroš Stritih, Petar Nusev, Matija Špegel
University of Ljubljana, Slovenia

5:33pm - 5:36pm

Experimental assessment of radiant panel for thermal conditioning of open spaces
Daniel Castro Medina¹, María del Carmen Guerrero Delgado¹, Teresa Rocio Palomo Amores¹, Alberto Cerezo Narváez², José Sánchez Ramos¹, Servando Álvarez Domínguez¹
¹University of Seville, Spain; ²University of Cadiz, Spain

5:36pm - 5:39pm

Energetic Impact of Temperature Gradients in Heat Re-recovery in Ventilation in Dwellings
Josué Borrajo Bastero, Eline Himpe, Jelle Laverge
Ghent University, Belgium

5:39pm - 5:42pm

Mine water geothermal energy - abandoned mines as a green energy source

Lukas Oppelt, Thomas Grab, Timm Wunderlich, Thomas Storch, Tobias Fieback
TU Bergakademie Freiberg, Germany

MD03: Parallel session Monday D03 (Health & Comfort - Mitigation strategies for COVID-19)

Time: Monday, 23/May/2022: 4:15pm - 5:45pm · Location: Rotterdam A

Session Chair: Jarek Kurnitski

4:15pm - 4:27pm

The Indoor Air Quality, Ventilation and Energy Nexus in the COVID-19 Context

Talie Tohidi Moghadam¹, Carlos Ochoa², María Jesús López Zambrano², Ken Bruton¹, Dominic O'Sullivan¹

¹Intelligent Efficiency Research Group, University College Cork, Cork, Ireland; ²International Energy Research Centre, Tyndall National Institute, Cork, Ireland

4:27pm - 4:39pm

Development of an automatic sliding window system to control adequate ventilation rate

Akane Tsutsumi¹, Sihwan Lee²

¹Shinshu University, Japan; ²Nagoya University, Japan

4:39pm - 4:51pm

Influence of a portable air cleaner location on the exposure to exhaled contaminants in hospital rooms

José Luis Sánchez-Jiménez, Manuel Ruiz de Adana

University of Cordoba, Spain

4:51pm - 5:03pm

Holistic operating room hygiene control for air and surface cleanliness

Kim Harri Hagström, Ismo Alvar Grönvall

Halton Oy, Finland

5:03pm - 5:15pm

Thermal inactivation of the corona virus (SARS-CoV-2) in air volumes

André Schlott¹, Thomas Hutsch¹, Eileen Sauer², Jens Wetschky², Jana Hessel², Susanne Bailer², John Laubert³, Stefan Lösch³

¹Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Branch Lab Dresden, Germany; ²Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB, Germany; ³Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Germany

5:15pm - 5:27pm

NUMERICAL ANALYSIS OF GERMICIDAL UV-C LAMP AIR DISINFECTION SYSTEM

Tunahan Akis¹, Ziya Haktan Karadeniz², Orhan Ekren¹

¹Ege Üniversitesi, Solar Energy Institute, İzmir Turkey; ²İzmir Institute of Technology, Energy Systems Engineering Department, İzmir, Turkey

5:27pm - 5:39pm

Modeling the impact of indoor relative humidity on the airborne transmission of several respiratory viruses risk using a modified Wells-Riley model

Amar Aganovic¹, Yang Bi², Guangyu Cao², Jarek Kurnitski³, Pawel Wargocki⁴

¹The Arctic University of Norway, Norway; ²Norwegian University of Science and Technology; ³TalTech – Tallinn University of Technology; ⁴Technical University of Denmark

5:39pm - 5:42pm

Limiting the spread of long-range airborne diseases in Long Term Care Facilities

Janneke Maria Adriana de Kort, Marcel Loomans, Lisanne Havinga

Technical University Eindhoven, Netherlands, The

5:42pm - 5:45pm

Understanding effects of ventilation on airborne microorganisms in build environments: A perspective

So Fujiyoshi^{1,2}, Mateja Dovjak^{2,3}, Janja Vaupotič⁴, Fumito Maruyama^{1,2}

¹Office of Research and Academia-Government-Community Collaboration Hiroshima University; ²Center for Holobiome and Built environment (CHOBE), Hiroshima University; ³Faculty of Civil and Geodetic Engineering, University of Ljubljana; ⁴Department of Environmental Sciences, Jožef Stefan Institute

MD04: Parallel session Monday D04 (Health & Comfort - IAQ assessment)

Time: Monday, 23/May/2022: 4:15pm - 5:45pm · Location: Rotterdam B

Session Chair: Anne Sørensen

4:15pm - 4:27pm

Application of Adapted Tracer Gas Test for Ventilation Assessment in Two Locations

Sarah Lima Paralovo^{1,2}, Marianne Stranger², Borislav Lazarov², Maarten Spruyt², Jelle Laverge¹

¹Ghent University, Belgium; ²VITO, Belgium

4:27pm - 4:39pm

Age of Air Measurement in Air-recirculating Systems Applying Dynamic Steady-state Concentration Theory

Haruki Taguchi¹, Takashi Kurabuchi¹, Jinya Takeuchi², Hajime Yoshino³, Yoshihiro Toriumi⁴, Masaki Shimizu¹

¹Tokyo University of Science, Japan; ²Akita Prefectural University; ³Nippon Institute of Technology; ⁴Tokyo Denki University

4:39pm - 4:51pm

Determination of ventilation effectiveness with tracer gas methods under COVID-19 conditions

Beat Frei¹, Heinrich Huber², Moritz Bienz², Kevin Bucheli²

¹FREI WÜEST EXPERT, Willisau, Switzerland; ²LUCERNE UNIVERSITY OF APPLIED SCIENCES, Horw/Lucerne, Switzerland

4:51pm - 5:03pm

CO2 levels as an indicator of ventilation performance in me-chanical ventilated buildings

Natalia Lastovets, Piia Sormunen, Ksenia Ruuska

Tampere University, Finland

5:03pm - 5:15pm

New developments in odour testing: Adapter connects emission test chamber and funnel

Simone Brandt¹, Frank Brozowski³, Wolfgang Horn², Wolfgang Plehn³, Birgit Müller¹

¹University of Applied Sciences (HTW Berlin), Germany; ²Bundesanstalt für Materialforschung und -prüfung (BAM), Germany; ³German Environment Agency (UBA), Germany

5:15pm - 5:27pm

Determining representative volatile organic components affecting indoor air quality in shopping centers

Mahmoud ElMokadem, Kai Rewitz, Dirk Müller

RWTH Aachen University, E.ON Energy Research Center, Germany

5:27pm - 5:30pm

Indoor Air Quality Evaluation of guests' rooms in hotel building: a Case Study of Turówka Hotel

Klaudia Zwolińska, Bernadetta Ryba, Marek Borowski

AGH University of Science and Technology, Poland

5:30pm - 5:33pm

Assessment of environmental perception of inhabitants of the municipality of Américo Brasiliense on thermal comfort and climate change

João Pedro Panagassi Forte¹, Eva Maria Morais de Azevedo²

¹Lisbon University Institute, Portugal; ²Federal University of Pernambuco, Brazil

MD05: Parallel session Monday D05 (Digitization)

Time: Monday, 23/May/2022: 4:15pm - 5:45pm · Location: Dock 7

Session Chair: Gabriel Fierro

4:15pm - 4:27pm

Development of a multi-criteria decision support tool for sustainable building retrofits

Zaid Romani¹, Abdeslam Draoui², Francis Allard³

¹LaRAT, National School of Architecture of Tetouan - Morocco, Morocco; ²ETTE, Abdelmalek Essaâdi University, Morocco; ³LaSIE, La Rochelle University, France

4:27pm - 4:39pm

From Data To Control: Learning an HVAC Control Policy

Bram de Wit¹, Lambert Schomaker², Jaap Broekhuizen¹

¹Advanced Climate Systems (ACS); ²University of Groningen (RUG)

4:39pm - 4:51pm

Development and evaluation of digital twins for district-level heating energy demand simulation

Twan Johannes Hendrikus Rovers¹, Christian Struck¹, Chris Gieling¹, Saleh Mohammadi¹, Olaf Slagmolen¹, André Dorée², Léon Olde Scholtenhuis², Karina Vink², Hans Poppe³, Daniëlle Koopman⁴, Herbert ter Maat⁴, Berto Boeve⁵

¹Chair of Sustainable Building Technology, School of Business, Building & Technology, Saxion University of Applied Sciences, Enschede, the Netherlands; ²Department of Construction Management and Engineering, Faculty Engineering Technology, University of Twente, Enschede, the Netherlands; ³ROC van Twente, Hengelo, the Netherlands; ⁴Municipality of Enschede, Enschede, the Netherlands; ⁵Loohuis Energie & Installatie Advies, Almelo, the Netherlands

4:51pm - 5:03pm

Data driven energy efficiency in an air heated office building in Norway

Natasa Nord¹, Ingrid Jæger Landsnes², Yuemin Ding³

¹Norwegian University of Science and Technology, Norway; ²GK Indoor Environment; ³University of Navarra

5:03pm - 5:15pm

An ontology-based approach for building automation data analysis

Eunju Park, Sume Park, Sebastian Stratbucker

Fraunhofer-Institut für Bauphysik IBP, Germany

5:15pm - 5:27pm

Co-simulation studies of optimal control for natural refrigerant heat pumps

Thibault Péan¹, Daniel Ramón Lumbierres¹, Alba Colet¹, Ivan Bellanco¹, Martin Neugebauer², Daniel Carbonell Sanchez², Jon Iturralde Iñarga³, Cristina Corchero García⁴, Jaume Salom¹

¹Catalonia Institute for Energy Research (IREC), Spain; ²Institute for Solar Technology SPF-OST, Switzerland; ³Tecnalia, Spain; ⁴Universitat Politècnica de Catalunya-BarcelonaTech, Spain

5:27pm - 5:39pm

Enhanced building energy flexibility using passive PCM envelope and HVAC control automation

Mohammad Saffari¹, Conor Roe², Donal P. Finn^{2,3}

¹School of Mechanical and Manufacturing Engineering, Dublin City University, Ireland; ²School of Mechanical and Materials Engineering, University College Dublin, Ireland; ³UCD Energy Institute, University College Dublin, Ireland

5:39pm - 5:42pm

Verification of Energy Efficiency Measures in Three Apartment Buildings Using Gaussian Process

Sakari Uusitalo

Tampere University of Applied Sciences, Finland

5:42pm - 5:45pm

The role of simulation in design of high-performance buildings in Turkey

Gülsu Ulukavak Harputluğil¹, Pieter De Wilde²

¹Cankaya University, Turkey; ²Strachclyde University, UK

TA01: Parallel session Tuesday A01 (Energy)

Time: Tuesday, 24/May/2022: 9:30am - 10:30am · Location: Rotterdam A

Session Chair: Martin Tenpierik

9:30am - 9:42am

Modelling of District Heating Systems: Comparative Evaluation of White-box Modelling Approaches

Guokai Chen, Ivan Korolija, Dimitrios Rovas

University College London, United Kingdom

9:42am - 9:54am

A Case study of the sensible and latent heat flux of a ceiling radiant cooling panel with superhydrophobic treatment

Ziwen Zhong¹, Wei Ma², Shuhuai Yao², Jianlei Niu¹

¹Department of Building Energy and Environment Engineering, The Hong Kong Polytechnic University, Hong Kong, China;

²Department of Mechanical Engineering, The Hong Kong University of Science and Technology, Hong Kong, China

9:54am - 10:06am

Performance analysis of water-to-water CO2 heat pump in different compressor rotational speed

Yantong Li, Natasa Nord

NTNU, Norway

10:06am - 10:18am

FASTLANE – Dynamic approach to low carbon and energy producing real estate portfolios – case Amsterdam Universities

Thomas Verhoeven¹, Rowan Boeters^{2,3}, Wim Maassen¹

¹Royal HaskoningDHV, Netherlands, The; ²University of Amsterdam; ³Amsterdam University of Applied Sciences

10:18am - 10:30am

Development of an energy analysis tool for data center free cooling technologies modelization and comparison in different climate conditions

Mauro Mantovan¹, Carlo Bissaro¹, Fabio Poletto¹, Michele De Carli², Angelo Zarrella²

¹Hiref SpA, Italy; ²Università degli Studi di Padova, Italy

TA02: Parallel session Tuesday A02 (Energy)

Time: Tuesday, 24/May/2022: 9:30am - 10:30am · Location: Rotterdam B

Session Chair: Tarlea Gratiela-Maria

9:30am - 9:42am

Adjusting the design of a radiant heating system for office retrofit

Barbora Junasová¹, Ondřej Šikula², Michal Krajčík¹, Muslum Arici³, Martin Šimko¹

¹Slovak University of Technology Bratislava, Slovak Republic; ²Brno University of Technology, Czech Republic; ³Kocaeli University, Turkey.

9:42am - 9:54am

Heat recovery potential from ventilated passive and active facades: A numerical study

Mohammad Rahiminejad, Dolaana Khovalyg

Ecole Polytechnique Fédérale de Lausanne (EPFL), Integrated Comfort Engineering (ICE), CH-1015 Lausanne, Switzerland

9:54am - 10:06am

Heat recovery ventilation solutions for school building renovation – case study

Helena Kuivijögi¹, Henri Sarevet¹, Martin Thalfeldt¹, Jarek Kurnitski²

¹FinEst Centre for Smart Cities (Finest Centre), Tallinn University of Technology; ²Aalto University, School of Engineering, Department of Civil and Structural Engineering, Finland

10:06am - 10:18am

A Practical Application of DC Droop Control with IoT capabilities

Damiën Zuidervliet, Holly Engelbrecht, Christiaan Nagy, Diëgo Zuidervliet, Peter van Duijsen

Haagse Hogeschool, The Netherlands

10:18am - 10:30am

Exergy Guided Optimization Model for Decarbonized Solar Districts

Birol Kilikis

OSTIM Technical University Mechanical Engineering Dept, Turkey

TA03: Parallel session Tuesday A03 (Health & Comfort - Monitoring and control)

Time: Tuesday, 24/May/2022: 9:30am - 10:30am · Location: Dock 14

Session Chair: Marcel Loomans

9:30am - 9:42am

Personal comfort model for automatic control of personal comfort systems

Dragos-loan Bogatu¹, Ongun Berk Kazanci¹, Futa Watanabe², Yosuke Kaneko², Bjarne W. Olesen¹

¹Technical University of Denmark, Denmark; ²Mitsubishi Electric Corporation, Japan

9:42am - 9:54am

Development and initial testing of a Personalized Environmental Control System (PECS)

Ongun Berk Kazanci¹, Jun Shinoda¹, Hang Yin¹, Dragos-loan Bogatu¹, Futa Watanabe², Yosuke Kaneko², Bjarne W Olesen¹

¹International Centre for Indoor Environment and Energy, Technical University of Denmark; ²Mitsubishi Electric Corporation

9:54am - 10:06am

Estimating Long-Term Indoor PM2.5 of Outdoor and Indoor Origin using Low-Cost Sensors

Tongling Xia¹, Yue Qi², Xilei Dai³, Ruoyu You⁴, Dayi Lai⁵, Junjie Liu³, Chun Chen^{1,6}

¹Department of Mechanical and Automation Engineering, The Chinese University of Hong Kong, Shatin, N.T. 999077, Hong Kong SAR, China; ²Shanghai Research Institute of Building Sciences (Group) Co., Ltd, Shanghai 201108, China; ³Tianjin Key Lab of Indoor Air Environmental Quality Control, School of Environmental Science and Engineering, Tianjin University, Tianjin, 300072, China; ⁴Department of Building Services Engineering, The Hong Kong Polytechnic University, Kowloon, 999077, Hong Kong SAR, China; ⁵School of Design, Shanghai Jiao Tong University, Shanghai 200240, China; ⁶Shenzhen Research Institute, The Chinese University of Hong Kong, Shenzhen 518057, China

10:06am - 10:18am

Reproduction of Thermal Plume above Commercial Cooking Gas Stove using CFD Analysis

Takao Osawa¹, Takashi Kurabuchi¹, Yoshihiro Toriumi², Sihwan LEE³, Yuki Shimanuki⁴

¹Tokyo University of Science; ²Tokyo Denki University; ³Shinshu University; ⁴Tokyo Gas Co., Ltd.

10:18am - 10:30am

Temperature calibration and Annual performance of cooling for ceiling panels

Seyed Shahabaldin Seyed Salehi², Karl-Villem Võsa², Jarek Kurnitski^{1,2,3}, Martin Thalfeldt^{1,2}

¹FinEst Centre for Smart Cities (Finest Centre), Tallinn University of Technology, 19086 Tallinn, Estonia; ²Department of Civil Engineering and Architecture, Tallinn University of Technology, 19086 Tallinn, Estonia; ³Department of Civil Engineering, Aalto University, 00076 Aalto, Finland

TA04: Parallel session Tuesday A04 (Health & Comfort - Cooking and other pollutants)

Time: Tuesday, 24/May/2022: 9:30am - 10:30am · Location: Rotterdam D

Session Chair: Risto Kosonen

9:30am - 9:42am

Cooking habits and usage of kitchen hoods in Norwegian homes

Adele Helene Ninauve Jutulstad¹, Aileen Yang², Peter Geoffrey Schild¹, Arnab Chaudhuri¹, Kari Thunshelle²

¹OsloMet - Oslo Metropolitan University, Oslo, Norway; ²SINTEF Community, Oslo, Norway

9:42am - 9:54am

Cooking emissions from typical Norwegian meals: basis for advanced exposure studies

Adele Helene Ninauve Jutulstad¹, Aileen Yang², Peter Geoffrey Schild¹, Arnab Chaudhuri¹, Kari Thunshelle²

¹OsloMet - Oslo Metropolitan University, Oslo, Norway; ²SINTEF Community, Norway

9:54am - 10:06am

Kitchen ventilation system design and its effect on restaurant IAQ

Kamal Moumen, Nicolas Delporte

Halton Foodservice, France

10:06am - 10:18am

A Comparison of Indoor Pollution using Different Ventilation Methods: A Case Study

Salam Chaker Al Samman, Amr Suliman

Loughborough University, United Kingdom

10:18am - 10:21am

Impact of Ventilation Air Supply Type on Indoor/Outdoor PM: In-Situ Measurements

Kevin Verniers¹, Frederik Losfeld¹, Ivan Pollet¹, Jelle Laverge²

¹Renson Ventilation NV, Belgium; ²Ghent University, Department of Architecture and Urban Planning

10:21am - 10:24am

Experiment on Indoor Pollutants Reduction from Duct System Applied with TiO₂ Photocatalyst

Seong Eun Kim, Yong Woo Song, Jin Chul Park

Chung-Ang University, Korea, Republic of (South Korea)

10:24am - 10:27am

Special Systems of Foul Water Stacks in High-Rise Buildings

Martin Sokol, Jana Peráčková, Tatjana Jánošková

Slovak University of Technology in Bratislava, Slovak Republic

TA05: Parallel session Tuesday A05 (Digitization)

Time: Tuesday, 24/May/2022: 9:30am - 10:30am · Location: Dock 7

Session Chair: Donal Finn

9:30am - 9:42am

Floor heating pre-on/off parameters based on Model Predictive Control feature extrapolation

Ettore Zanetti, Rossella Alesci, Rossano Scoccia, Marcello Aprile

Department of Energy, Politecnico di Milano, Italy

9:42am - 9:54am

Interoperability as a driver or barrier of smart building technologies?

Stijn Verbeke^{1,2,3}, Karine Laffont⁴, David Emanuel Rua⁵

¹University of Antwerp, Belgium; ²VITO NV; ³EnergyVille; ⁴Dowel; ⁵Inesctec

9:54am - 10:06am

An early prototype for fault detection and diagnosis of Air-Handling Units

Shobhit Chitkara¹, Alet van den Brink², Shalika Walker¹, Wim Zeiler¹

¹Department of the Built Environment, Eindhoven University of Technology, Eindhoven, the Netherlands; ²Afdeling O&T, Kropman Installatietechniek B.V, Nijmegen, the Netherlands

10:06am - 10:18am

DEVELOPMENT OF AN OPTIMIZATION MODEL FOR DECISION MAKING IN BUILDING RETROFIT PROJECTS USING TRNSYS AND MOBO

Ehsan Asadi, Manuel Carlos Gameiro da Silva

ADAI – LAETA, Department of Mechanical Engineering, University of Coimbra, Portugal

10:18am - 10:30am

Real-time Model Predictive Control with Digital Twins and Edge Computing Technologies

Michael Berger, Filippo Bernardello, Craig Barry, Pravesh Badjoonauth, Shruthi Balaji, Michael Lakhdar

Conserve It

TB01: Parallel session Tuesday B01 (Energy)

Time: Tuesday, 24/May/2022: 11:00am - 12:30pm · Location: Rotterdam A

Session Chair: Regina Bokel

11:00am - 11:12am

Performance analysis of heat pump assisted desiccant cooling system through experiment

Tae Ha Leigh¹, Se Jin Lee¹, Chang Ho Jeong², Myoung Souk Yeo³

¹Department of Architecture and Architectural Engineering, Graduate School, Seoul National University, Seoul 08826, Korea;

²Division of Architecture for Urban Planning & Real Estate Development, The University of Suwon, Hwaseong 18323, Korea;

³Department of Architecture and Architectural Engineering, Institute of Construction and Environmental Engineering, Seoul National University, Seoul 08826, Korea

11:12am - 11:24am

Economic and Energy Performance of Heating and Ventilation Systems in Energy Retrofitted Norwegian Detached Houses

Vegard Heide¹, Bianca Kjellberg¹, Sondre Valstad Johansen¹, Håkon Selstad Thingbø¹, Anne Gunnarshaug Lien², Laurent Georges¹

¹Norwegian University of Science and Technology, Norway; ²SINTEF community, Trondheim, Norway

11:24am - 11:36am

Optimization of Novel Air-to-Refrigerant Heat Exchangers for Lower-GWP Refrigerants in Air-Conditioning Systems

James Tancabel, Vikrant Aute, Jiazhen Ling

University of Maryland, United States of America

11:36am - 11:48am

Parameter analysis of air-conditioning systems for high-tech cleanrooms considering climate impact

Wenxuan Zhao, Hangxin Li, Shengwei Wang

Hong Kong Polytechnic University, Hong Kong S.A.R. (China)

11:48am - 12:00pm

Predictive and flexible system controller for hybrid power supply systems

Martin Knorr, Tim van Beek, Maximilian Beyer, Lars Schinke, Joachim Seifert

TU Dresden, Germany

12:00pm - 12:12pm

Decision tree for early-stage design of hybridGEOTABS office buildings

Mohsen Sharifi, Eline Himpe, Rana Mahmoud, Jelle Laverge

Gent university, Belgium

12:12pm - 12:15pm

Analyze the energy-saving benefits of Taiwan's existing advanced energy-saving strategies through energy simulation

Feng-Yi Lin, Tzu-Ching Su, Pei-Yu Yu

Industrial Technology Research Institute, Taiwan

12:15pm - 12:18pm

Study on the efficiency of large shallow GSHP Systems. ELI-NP after one year operation

Razvan-Silviu Stefan¹, Delia Tinca¹, Radu-Mircea Damian²

¹ELI-NP, Romania; ²Technical University of Civil Engineering, Faculty of Building Services, Bucharest

12:18pm - 12:21pm

Design and energy consumption assessment for a modular hospital in Romania

Ioan Silviu Dobosi^{2,3}, Cristina Marincu¹, Silviana Brata¹, Stefan Duna^{2,3}, Nicoleta Kaba^{1,2}, Ioan Bistran³

¹Department of Civil Engineering and Building Services Engineering, Politehnica University Timisoara, Timisoara 300223, Romania;

²Romanian Association for Building Services Engineers – Banat Branch, Timisoara, Romania; ³SC Dositimpex SRL, Timisoara, Romania

12:21pm - 12:24pm

Study regarding the impact of the new EPB standards on the energy performance evaluation

Ioan Silviu Dobosi¹, Silvana Brata^{1,2}, Ioan Bistran³, Stefan Duna¹, Cristina Marincu²

¹Romanian Association for Building Services Engineers – Banat Branch, Timisoara, Romania; ²Department of Civil Engineering and Building Services Engineering, Politehnica University Timisoara, Timișoara 300223, Romania; ³SC Dosetimpex SRL, Timișoara, Romania

TB02: Parallel session Tuesday B02 (Energy)

Time: Tuesday, 24/May/2022: 11:00am - 12:30pm · Location: Rotterdam B

Session Chair: Jan Jaap Blüm

11:00am - 11:12am

Grid-impact factors of field-tested residential Proton Exchange Membrane Fuel Cell systems

Nicolas Paulus, Vincent Lemort

ULiege, Belgium

11:12am - 11:24am

Heat Pumps and Renewables in District Heating – Evaluation of Central and Decentral Approaches

Fabian Ochs, Mara Magni, Georgios Dermentzis

University of Innsbruck, Austria

11:24am - 11:36am

Simulation-based seasonal underground sensible heat storage integrated in a district heating network

Bram ter Meulen¹, Rene Geerts², Carlos Infante Ferreira¹

¹Delft University of Technology, Netherlands; ²Hocosto BV, Netherlands

11:36am - 11:48am

Optimized district heating system for combined operation with seasonal heat storage

Gijs Wolbert¹, Rene Geerts², Carlos Infante Ferreira¹

¹Delft University of Technology, Netherlands; ²Hocosto BV, Netherlands

11:48am - 12:00pm

Surefit - Sustainable solutions for affordable retrofitting of domestic buildings

Janne Petteri Hirvonen¹, Yangmin Wang¹, Juha Jokisalo^{1,2}, Risto Kosonen^{1,3}

¹Aalto University, School of Engineering, Espoo, Finland; ²Smart City Center of Excellence, TalTech, Tallinn, Estonia; ³College of Urban Construction, Nanjing Tech University, Nanjing, China

12:00pm - 12:12pm

A comparative study of solar cooling technologies

Beethoven Narváez-Romo, Eliane Hayashi Suzuki, José R Simões-Moreira

University of Sao Paulo, Brazil

12:12pm - 12:15pm

Air/water heat pumps: energy and environmental assessment in Mediterranean residential building sector

Carola Lingua¹, Sara Viazzo¹, Stefano Paolo Corgnati¹, Simonetta Lena², Leonardo Prendin²

¹TEBE-IEEM Research Group, Energy Department, Politecnico di Torino; ²RHOSS S.P.A.

12:15pm - 12:18pm

Experimental and numerical performance evaluation of building integrated photovoltaic with thermoelectric

Yong-Kwon Kang, Beom-Jun Kim, Soo-Jin Lee, Minseong Kim, Jae-Won Joung, Jae-Weon Jeong

Hanyang University, Korea, Republic of (South Korea)

12:18pm - 12:21pm

Implementation of a shallow geothermal energy system in a multi-source green building

Robert Gavriliuc^{1,2}, Tiberiu Catalina^{1,2}, Andrei-Stelian Bejan¹

¹UTCB - University, Romania; ²GEOEXCHANGE Society

12:21pm - 12:24pm

Study of Using R290 Refrigerant Replacement in a Heat Pump Application

Tarlea Gratiela-Maria¹, Mardare George¹, Tarlea Ana²

¹UTCB, Romania; ²AGFR, Romania

12:24pm - 12:27pm

Technical-economic and environmental analysis of DHW systems in Spanish climate zones

Emilio-José Sarabia-Escriba, Victor-Manuel Soto-Frances, Jose-Manuel Pinazo-Ojer

UNIVERSITAT POLITÈCNICA DE VALÈNCIA, Spain

TB03: Parallel session Tuesday B03 (Health & Comfort - Cooling systems)

Time: Tuesday, 24/May/2022: 11:00am - 12:30pm · Location: Dock 14

Session Chair: Gongsheng Huang

11:00am - 11:12am

Revisiting radiant cooling systems from a resiliency perspective: A preliminary study

Ongun Berk Kazanci, Jun Shinoda, Bjarne W Olesen

International Centre for Indoor Environment and Energy, Technical University of Denmark

11:12am - 11:24am

Simulation aided development of a façade-integrated air handling unit with a thermoelectric heat exchanger

Petr Zelensky¹, Vojtech Zavrel¹, Angelos Mylonas², Jordi Macia², Jordi Pascual²

¹CTU Prague, University Centre for Energy Efficient Buildings, Czech Republic; ²IREC Catalonia Institute for Energy Research, Spain

11:24am - 11:36am

Low-temperature radiant cooling panel for hot and humid climate

Gongsheng Huang, Nan Zhang, Yuying Liang

City University of Hong Kong, Hong Kong S.A.R. (China)

11:36am - 11:48am

Development and performance analysis of a novel multi-zone hybrid desiccant cooling system

Shuo Liu¹, Chang-Ho Jeong², Myoung-Souk Yeo³

¹Department of Architecture and Architectural Engineering, Graduate School, Seoul National University, Seoul, 08826, Korea;

²Division of Architecture for Urban Planning & Real Estate Development, The University of Suwon, Hwaseong, 18323, Korea;

³Institute of Construction and Environmental Engineering, Department of Architecture and Architectural Engineering, Seoul National University, Seoul, 08826, Korea

11:48am - 12:00pm

Summer comfort in residential buildings and small offices, using sustainable cooling systems

Margot De Pauw¹, Jeroen Van der Veken²

¹Thomas More, Kenniscentrum Energie, Geel, Belgium; ²Belgian Building Research Institute, HVAC lab, Limelette, Belgium

12:00pm - 12:12pm

Impact of future climate on the performances of ground-source cooling system

Abantika Sengupta¹, Pieter Proot¹, Tom Trioen¹, Hilde Breesch¹, Marijke Steeman²

¹KU Leuven, Belgium; ²Ghent University, Belgium

12:12pm - 12:24pm

Numerical and experimental studies on a hybrid panel element for heating, cooling and ventilation

Lars Schinke¹, André Schlott², Maximilian Beyer¹, Joachim Seifert¹

¹Technische Universität Dresden, Germany; ²Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM, Branch Lab Dresden

TB04: Parallel session Tuesday B04 (Health & Comfort - Offices)

Time: Tuesday, 24/May/2022: 11:00am - 12:30pm · Location: Rotterdam D

Session Chair: Peter Holzer

11:00am - 11:12am

Unsteady Ventilation in a Scaled Room Model with Swirl Ceiling Diffusers

Eva Mesenhöller^{1,2}, Steffen Jacobs^{1,3}, Peter Vennemann¹, Jeanette Hussong³

¹Department of Energy - Building Services - Environmental Engineering, Münster University of Applied Sciences, Germany; ²Department of Mechanical Engineering, Ruhr-University Bochum, Germany; ³Institute for Fluid Mechanics and Aerodynamics, Technical University of Darmstadt, Germany

11:12am - 11:24am

Evaluation of “ventilation resilience” in mid-sized office buildings

Douaa Al Assaad, Hilde Breesch

KU Leuven, Belgium

11:24am - 11:36am

Thermal environment in simulated office rooms generated by active ceiling diffuser with radiant panels

Panu Mustakallio¹, Pekka Kanerva¹, Yuxin Wu², Risto Kosonen^{3,4}

¹Halton Oy, Finland; ²Zhejiang Sci-Tech University, China; ³Aalto University, Finland; ⁴Nanjing Tech University, China

11:36am - 11:48am

A Methodology to assess economical impacts of poor IAQ in office buildings from DALY and SBS induced costs

Louis Cony, Jelle Laverge

Ghent University, France

11:48am - 12:00pm

Parametric Modelling Using the Operative Temperature Map for Façade Design of Office Buildings

Yaw-Shyan Tsay, Yu-Chen Lin

National Cheng-Kung University, Taiwan

12:00pm - 12:12pm

Field study of diffuse ceiling ventilation performance under high air change rate

Gael Tougne¹, Christian A. Hviid²

¹Saint-Gobain aereNmore; ²Technical University of Denmark

12:12pm - 12:15pm

Carbon capture from indoor air as an alternative ventilation technique

Jean Paul Harrouz, Kamel Ghali, Nesreene Ghaddar, Mohamad Hmadeh

American University of Beirut, Lebanon (Lebanese Republic)

12:15pm - 12:18pm

Performance evaluation of balanced heating and cooling with hydronic ceilings and floors

Peter Holzer¹, Philipp Stern¹, Georgios Gourlis²

¹IBR&I Institute of Building Research & Innovation, Austria; ²IPJ Ingenieurbüro P. Jung, Austria

TB05: Parallel session Tuesday B05 (Circularity)

Time: Tuesday, 24/May/2022: 11:00am - 12:30pm · Location: Dock 7

Session Chair: Olaf Oosting

11:00am - 11:12am

Application of circular technical services in a living lab in Ghent

Lode Lefevre¹, Cihan Kayaçetin¹, Hilde Breesch¹, Lieven Smeyers², Alexis Versele¹

¹KU Leuven, Belgium; ²Litobox, Belgium

11:12am - 11:24am

BIM-based circular building assessment and design for demountability

Lukianova Tetiana, Kayacetin Cihan, Lefevre Lode, Versele Alexis, Klein Ralf

KU Leuven, Department of Civil Engineering, Building Physics and Sustainable design, Technology Campus Ghent, Belgium

11:24am - 11:36am

Open BIM-based LCA of HVAC and circularity assessment using the Madaster platform

Sebastian Theißen¹, Björn Pelzer³, Jannick Höper¹, Jan Drzymalla³, Patrick Bergmann², Claudius Frank², Anica Meins-Becker³

¹University of Wuppertal, Institute of Building Information Modeling, Germany; ²Madaster Germany GmbH, Germany; ³TH Köln (University of Applied Sciences), Institute of Building Services Engineering, Germany

11:36am - 11:48am

The circularity of renovation solutions for residential buildings

Kalle Kuusk¹, Michiel Ritzen², Patrick Daly³, Dimitra Papadaki⁴, Cecilia Mazzoli⁵, Guzide Aslankaya⁶, Jure Vetršek⁷, Targo Kalamees¹

¹Tallinn University of Technology, Estonia; ²VITO NV, Belgium; ³Technological University Dublin; ⁴National and Kapodistrian University of Athens; ⁵Alma Mater Studiorum - Università di Bologna; ⁶PichArchitects; ⁷Institute for Innovation and Development of University of Ljubljana

11:48am - 12:00pm

Embodied Energy and Carbon of Residential Buildings: Towards an Actual nZEB Concept

Nazanin Moazzen¹, Touraj Ashrafian^{2,3}

¹Faculty of Architecture and Design, Maltepe University, Turkey; ²Faculty of Architecture and Design, Ozyegin University, Turkey; ³Building Materials and Physics Laboratory, Ozyegin University, Turkey

12:00pm - 12:12pm

Should we ventilate differently in an adaptable context? An exploratory LCA-study

Oskar Seuntjens, Bert Belmans, Matthias Buyle, Sandy Jorens, Zakarya Kabbara, Amaryllis Audenaert

Universiteit Antwerpen, Belgium

TC01: Parallel session Tuesday C01 (Energy)

Time: Tuesday, 24/May/2022: 2:15pm - 3:45pm · Location: Rotterdam A
Session Chair: Livio Mazzarella

2:15pm - 2:27pm

Determining the infiltration and exfiltration in Supertall and Mega Tall Buildings

Peter Simmonds¹, Duncan Phillips²

¹Building and Systems Analytics, Bergen, The Netherlands; ²RWDI, Guelph Ontario, Canada

2:27pm - 2:39pm

Identification of dynamic U-values for supply-air double windows based on experiments

Yujian Huang¹, Mohamed El Mankibi¹, Richard Cantin²

¹Université of Lyon, ENTPE, LTDS, UMR5513, 69120 Vaulx-en-Velin, France; ²Université of Lyon, ENTPE, UMR5513, 69120 Vaulx-en-Velin, France

2:39pm - 2:51pm

Development of occupancy-based multi-scale building archetypes

Divyanshu Sood¹, Ibrahim Alhindawi², Usman Ali¹, James A. McGrath², Miriam A. Byrne², James O'Donnell¹

¹School of Mechanical and Materials Engineering and Energy Institute, University College Dublin, Dublin, Ireland; ²School of Physics & Ryan Institute's Centre for Climate and Air Pollution Studies, National University of Ireland Galway, Galway, Ireland

2:51pm - 3:03pm

Data-driven statistical and machine learning modelling of real building stock energy use

Matthias Van Hove, Marc Delghust, Jelle Laverge

UGent, Department of Architecture and Urban Planning, Belgium

3:03pm - 3:15pm

Performance Evaluation of Passive Cooling in a Multi-Zone Apartment Building Based on Natural Ventilation

Essam Elnagar, Alanis Zeoli, Vincent Lemort

Thermodynamics Laboratory, Aerospace and Mechanical Engineering Department, Faculty of Applied Sciences, Université de Liège, Belgium

3:15pm - 3:27pm

From collective to individual decision-making: barriers and opportunities to improve the success rate of the energy retrofits in the Dutch owner-occupied sector

Shima Ebrahimigharehbaghi, Queena Qian, Gerdien de Vries, Henk Visscher

Delft University of Technology, Netherlands, The

3:27pm - 3:30pm

Designed vs. Actual Occupant Behaviour in Buildings – A Historical Perspective

Zsófia Deme Belafi

Budapest University of Technology and Economics, Hungary

3:30pm - 3:33pm

Variation in Indoor Thermal Environmental Parameters in an Open Space Office

Arnab Chatterjee, Verena M. Barthelmes, Dolaana Khovalyg

Integrated Comfort Engineering (ICE), Ecole Polytechnique Federale de Lausanne, Switzerland

3:33pm - 3:36pm

Theoretical analysis on active radiant heat reflector integrated phase change material wall

Gyu Bae Lee, Seong-young Cheon, Yong-Kwon Kang, Beom-Jun Kim, Jae-Won Joung, Jae-Weon Jeong

Hanyang University, Korea, Republic of (South Korea)

3:36pm - 3:39pm

Optimal dimensioning power of GSHP with district heating in an educational building

Tianchen Xue¹, Victoria Nadas², Juha Jokisalo^{1,3}, Risto Kosonen^{1,3,4}, Mika Vuolle², Markku Virtanen¹

¹Aalto University, Espoo, Finland; ²Equa Simulation Finland Oy, Espoo, Finland; ³Smart City Center of Excellence, TalTech, Tallinn, Estonia; ⁴Nanjing Tech University, Nanjing, China

3:39pm - 3:42pm

Energy performance contracting as an innovative tool for financing the building renovation in Slovakia, Central Europe

Veronika Gombošová, Michal Krajčík

Slovak university of Technology in Bratislava, Slovak Republic, Department of Building Services

3:42pm - 3:45pm

Energy demand with natural ventilation in unheated bedrooms, combined with balanced ventilation

Vegard Heide, Laurent Georges

Norwegian University of Science and Technology, Norway

TC02: Parallel session Tuesday C02 (Energy)

Time: Tuesday, 24/May/2022: 2:15pm - 3:45pm · Location: Rotterdam B
Session Chair: Ardeshir Mahdavi

2:15pm - 2:27pm

Advanced solutions to improve heat recovery from wastewater in a double heat exchanger

Mihnea Sandu¹, Aamjed Al Baiyati², Ilinca Nastase¹, Florin Bode¹, Cristiana Croitoru¹, Paul Danca^{1,3}

¹UTCB, Romania; ²Kut Technical Institute, Middle Technical University, Iraq; ³Department of Renewable Energy Sources National Institute for R&D in Electric Engineering ICPE-CA, Bucharest, Romania

2:27pm - 2:39pm

Decentralized storage in combined heat distribution circuits: how to control?

Stef Jacobs¹, Margot De Pauw², Peter Hellinckx³, Ivan Verhaert¹

¹University of Antwerp, EMIB, Antwerp, Belgium; ²Thomas More Kempen, Kenniscentrum Energie, Geel, Belgium; ³IDLab (University of Antwerp – imec), Antwerp, Belgium

2:39pm - 2:51pm

Phase change materials in facades of buildings for solar heating and cooling

Martin Tenpierik, Michela Turrin, Willem van der Spoel

Delft University of Technology, Faculty of Architecture and the Built Environment, The Netherlands

2:51pm - 3:03pm

Concise cycle test methods to evaluate heating/cooling systems with multiple renewable sources

Robert Haberl¹, Maïke Schubert¹, Thibault Péan², Iván Bellanco², Francisco Belio², Jaume Salom², Daniel Carbonell¹

¹SPF Institute for Solar Technology, OST Eastern Switzerland University of Applied Sciences, Switzerland; ²Catalonia Institute for Energy Research (IREC), Spain

3:03pm - 3:15pm

Biomass in District Energy Systems: Overview and Perspectives for an Italian Case-Study

Lorenzo Teso, Tiziano Dalla Mora, Piercarlo Romagnoni

University IUAV of Venice, Italy

3:15pm - 3:27pm

Performance evaluation of a R-290 dual-source heat pump for heating and cooling

Laura Alonso, Xabier Peña, Felipe Trebilcock, Julen Hernandez, Aitor Agirre

TECNALIA RESEARCH & INNOVATION, Spain

3:27pm - 3:30pm

Overview and assessment of radiant systems in three administrative buildings

Emília Madarasová, Eva Švarcová, Dušan Petráš

Slovak University of Technology in Bratislava, Faculty of Civil Engineering, Department of Building Services, Slovak Republic

3:30pm - 3:33pm

Total Cost of Ownership of Sensor Faucets in Commercial and Healthcare Construction

Blake Wentz¹, Marie Patterson², Tim Wentz³

¹California State University, Chico, United States of America; ²California State University, Chico, United States of America; ³University of Nebraska-Lincoln, United States of America

3:33pm - 3:36pm

Examination of life cycle cost in nZEB design

Makiko Ukai¹, Masaya Okumiya², Gyuyoung Yoon³, Hideharu Niwa⁴

¹Nagoya University; ²Nagoya Industrial Science Research Institute, Japan; ³Nagoya City University; ⁴NIKKEN SEKKEI Research Institute

3:36pm - 3:39pm

Development of a building thermal solution using solar renewable energy production

Eusebio Conceição¹, João Gomes², Mª Inês Conceição³, Mª Manuela Lúcio¹, Hazim Awbi⁴

¹FCT-Universidade do Algarve, Portugal; ²CINTAL, Campus de Gambelas, 8005-139 Faro, Portugal; ³Instituto Superior Técnico, University of Lisbon, Portugal; ⁴School of Built Environment, University of Reading, Reading, UK

3:39pm - 3:42pm

Improving Roofs to Reduce Energy and Protect Occupants from Climate Change

Delia D'Agostino, Danny Parker

Joint Research Centre, European Commission, Ispra (VA), Italy

TC03: Parallel session Tuesday C03 (Health & Comfort - Personal ventilation)

Time: Tuesday, 24/May/2022: 2:15pm - 3:45pm · Location: Dock 14

Session Chair: Petr Zelensky

2:15pm - 2:27pm

Individual control of the frequency of intermittent personalized ventilation and its effect on cross-contamination in an office space

Elvire Katramiz, Nesreen Ghaddar, Kamel Ghali

American University of Beirut, Lebanon (Lebanese Republic)

2:27pm - 2:39pm

Local heating and cooling effectiveness - an evaluation method based on calculated local and overall thermal state

Mohamad Rida, Dolaana Khovalyg

Integrated Comfort Engineering (ICE), Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland

2:39pm - 2:51pm

The effects of novel personal comfort systems on thermal comfort and thermophysiology

Wei Luo¹, Rick Kramer^{1,3}, Yvonne de Kort², Pascal Rense¹, Wouter van Marken Lichtenbelt¹

¹Department of Nutrition and Movement Sciences, NUTRIM, Maastricht University, Maastricht, P.O. Box 616, 6200MD, The Netherlands; ²Department of Industrial Engineering and Innovation Sciences, Eindhoven University of Technology, P.O. Box 513, 5600MB, Eindhoven, The Netherlands; ³Department of the Built Environment, Eindhoven University of Technology, P.O. Box 513, 5600MB, Eindhoven, The Netherlands

2:51pm - 3:03pm

The experimental study of the indoor climate with the micro-environment systems

Weixin Zhao¹, Risto Kosonen^{1,2}, Simo Kilpeläinen¹, Sami Lestinen¹

¹Aalto University, Department of Mechanical Engineering, Finland; ²College of Urban Construction, Nanjing Tech University, China

3:03pm - 3:15pm

Investigation of PECS on the basis of a virtual building controller

Katharina Boudier, Sabine Hoffmann

TU Kaiserslautern, Germany

3:15pm - 3:27pm

Simulation-Aided Development of a Compact Local Ventilation Unit with the Use of CFD Analysis

Petr Zelensky^{1,2}, Martin Barták^{1,2}, Vladimír Zmrhal^{1,2}, Juraj Mázik³

¹Department of Environmental Engineering, Faculty of Mechanical Engineering, CTU Prague, Czech Republic; ²University Centre for Energy Efficient Buildings, CTU Prague, Czech Republic; ³RECUAIR, Kralupy nad Vltavou, Czech Republic

3:27pm - 3:39pm

The conceptualization of exhalation in buildings

Sara Dorregaray-Oyaregui, Amaia Zuazoa-Ros, César Martín-Gómez, Robiel Eilyn Manzueta Felix

Universidad de Navarra, Spain

3:39pm - 3:42pm

Numerical Analysis of Age of Air and Suspended Particle Distribution in Ventilated Operating Room

Riou Yamada¹, Hideaki Nagano², Hidehiro Asami², U Yanagi³, Shinsuke Kato⁴

¹Graduate school of Tokyo city university, Japan; ²Tokyo city university, Japan; ³Kogakuin University; ⁴The University of Tokyo

TC04: Parallel session Tuesday C04 (Health & Comfort - IEQ and energy efficient retrofit)

Time: Tuesday, 24/May/2022: 2:15pm - 3:45pm · Location: Rotterdam D
Session Chair: Bas Hasselaar

2:15pm - 2:27pm

Review of health and well-being aspects in Green Certification Protocols

Cécile Berquand¹, Verena Marie Barthelmes¹, Giorgia Spigliantini², Giulia Vergerio², Cristina Becchio², Stefano Paolo Corgnati², Dolaana Khovalyg¹

¹Laboratory of Integrated Comfort Engineering (ICE), École polytechnique fédérale de Lausanne (EPFL), Switzerland; ²TEBE-IEEM Research Group, Energy Department, Politecnico di Torino

2:27pm - 2:39pm

Nearly Zero Energy Buildings as a Standard of 21st Century – Velux RenovActive

Anna Predajnianska, Eva Švarcová, Imrich Sánka, Dušan Petráš

Slovak University of Technology in Bratislava, Faculty of Civil Engineering, Department of Building Services, Slovak Republic

2:39pm - 2:51pm

Monitoring (N)ZEB dwellings in the Netherlands: Lessons learned from current practices

Olivia Guerra-Santin¹, Twan Rovers², Laure Itard³

¹Eindhoven University of Technology, Department of the Built Environment; ²Saxion University of Applied Sciences, School of Business, Building & Technology; ³Delft University of Technology, Faculty of Architecture and the Built Environment

2:51pm - 3:03pm

Monitoring the change of indoor environmental conditions of refurbished buildings in Milan

Jacopo Vivian^{1,2}, Laura Carnieletto¹, Michele De Carli¹

¹Department of Industrial Engineering, University of Padova, Padova, Italy; ²Urban Energy Systems Lab, EMPA Materials Science and Technology, Dübendorf, Switzerland.

3:03pm - 3:15pm

Impact of Climate Change on the Design of Air Handling Units

Christian Fieberg, Dominik Demmelhuber

Westphalian University of Applied Science, Germany

3:15pm - 3:27pm

Experimental analysis of the ventilation rate in an amphitheater operating under the COVID-19 pandemic

Lúisa Dias Pereira, José Joaquim da Costa, Manuel Carlos Gameiro da Silva

University of Coimbra, ADAI, Department of Mechanical Engineering, Portugal

3:27pm - 3:39pm

Savings achieved in operating rooms by implementing ventilation air flow regulation strategies, in several climatic zones of Spain.

Julio F. San José-Alonso^{1,2}, Francisco J. Rey-Martínez^{1,2}, Eloy Velasco-Gómez^{1,2}, Ana Tejero-González^{1,2}, Paula M. Esquivias-Fernández¹, Yolanda Arroyo-Gómez^{1,2}, Javier M. Rey-Hernández^{1,3}

¹GIRTER Research Unit, University of Valladolid, Spain; ²Energy and Fluid Mechanics Department, University of Valladolid (Spain).; ³Higher Polytechnic School, European University Miguel de Cervantes (Spain)

3:39pm - 3:42pm

Integrating health & comfort into building design. How Active House and other labels can help improve

Bas Hasselaar, Merlijn Huijbers, Antwan van Haaren

DGMR, Netherlands, The

3:42pm - 3:45pm

Technology concepts for rapid renovation using adaptable lightweight façade systems

Daniel Adamovský¹, Jan Včelák¹, Pavel Mlejnek¹, Jaume Colom², Zuzana Prochazkova³, Constantinos Tsoutis⁴, Daniel Philippen⁵, Maria Founti⁶

¹Czech Technical University in Prague, University Centre for Energy Efficient Buildings of Czech Technical University in Prague;

²Dvelops; ³PichArchitects; ⁴AMSolutions; ⁵Institute for Solar Technology SPF of Eastern Switzerland University of Applied Sciences OST; ⁶Lab. of Heterogeneous Mixtures & Combustion Systems, School of Mechanical Engineering, National Technical University of Athens

TC05: Parallel session Tuesday C05 (Learning & Education)

Time: Tuesday, 24/May/2022: 2:15pm - 3:45pm · Location: Dock 7
Session Chair: Christian Struck

2:15pm - 2:27pm

Integral design a necessity for sustainable building design

Wim Zeiler

TU Eindhoven, Netherlands, The

2:27pm - 2:39pm

Integrating technology, education and practice to change energy behaviours in schools

Edelle Doherty¹, Dmitry Brychkov¹, Natalia Romero Herrera², Eilish McLoughlin³, Nadine Roudil⁴, Sander Smit⁵, Stefan Maas⁶, Branca Arthur Delmonte⁶, Florence Gauthier⁷, Eoghan Clifford¹

¹National University of Ireland, Galway, Ireland; ²Delft University of Technology, Delft, The Netherlands; ³Centre for the Advancement of STEM Teaching and Learning and School of Physical Sciences, Dublin City University, Ireland; ⁴Ecole d'Architecture Paris Val de Seine, France; ⁵R2M Solution, Italy; ⁶University of Luxembourg, Luxembourg; ⁷Region Centre-Val de Loire, France

2:39pm - 2:51pm

From insight into energy transition maturity to powerful task-based cross-sectoral upskilling

Jan Cromwijk¹, Carmen Poort¹, Tomo Cerovšek², Andrea Moro³, Martin Breen⁴

¹ISSO, Netherlands, The; ²Faculty of Civil and Geodetic Engineering, Slovenia; ³iSBE, Italia; ⁴Technological University of the Shannon, Ireland

2:51pm - 3:03pm

Interactive worksheets as a resource for teaching building performance and energy systems simulation

Roel Loonen

Eindhoven University of Technology, Netherlands, The

3:03pm - 3:15pm

A first attempt in shaping learning communities for the energy transition

Margot van Rees¹, Mirte Disberg-van Geloven¹, Amber Kornet¹, Stephan Corporaal¹, Maaïke Endedijk²

¹Saxion Hogeschool, Netherlands, The; ²University of Twente, the Netherlands

3:15pm - 3:18pm

Flipped Classroom Concept for Industry 4.0 Pump Monitoring in Building Information Technology

Daniel Eichberger

TH Köln University of Applied Sciences, Germany (Alumni)

3:18pm - 3:21pm

Data encounters in renovated homes: Sense-making beyond displays

Evert van Beek, Stella Boess

Delft University of Technology, Netherlands, The

TD01: Parallel session Tuesday D01 (Energy)

Time: Tuesday, 24/May/2022: 4:15pm - 5:45pm · Location: Rotterdam A
Session Chair: Marcel Loomans

4:15pm - 4:27pm

Adaptive Envelopes for Better Energy Efficiency and Enhanced Indoor Thermal Comfort

André Badura¹, Ivo Martinac¹, Birgit Müller²

¹KTH Royal Institute of Technology ABE Division of Sustainable Buildings, Stockholm, Sweden; ²HTW Berlin - University of Applied Sciences Building energy technology, Berlin, Germany

4:27pm - 4:39pm

Benchmarking the measured energy use of Nordic residential buildings and their Zero Energy-readiness

Andrea Ferrantelli^{1,2}, Martin Thalfeldt^{1,2}, Jarek Kurnitski^{1,2,3}

¹FinEst Centre for Smart Cities (Finest Centre), Tallinn University of Technology, 19086 Tallinn, Estonia; ²nZEB Research Group, Tallinn University of Technology, 19086 Tallinn, Estonia; ³Department of Civil Engineering, Aalto University, 00076 Aalto, Finland

4:39pm - 4:51pm

Passive cooling techniques to improve resilience of nZEBs in Belgium

Alanis Sarah Zeoli, Vincent Lemort

University of Liege, Belgium

4:51pm - 5:03pm

Humidification in healthcare facilities - knowledge base and practice

Marcel G.L.C. Loomans¹, Karin Kompatscher², Emelieke Huisman³, Helianthe S.M. Kort^{1,3}, Wim Maassen¹, Roberto Traversari²

¹Eindhoven University of Technology, Netherlands, The; ²TNO, Netherlands, The; ³HU University of Applied Sciences Utrecht, Netherlands, The

5:03pm - 5:15pm

TOWARDS ZERO ENERGY HOSPITAL BUILDINGS – ENERGY SAVING OPPORTUNITIES IN STEAM AND HUMIDIFICATION INSTALLATIONS

Cristiane Ferreira Porto², Wim Maassen^{1,2}, Erik Swinkels¹, Perry van de Graaf³, Wim Zeiler²

¹Royal HaskoningDHV, Netherlands, The; ²Eindhoven University of Technology; ³Utrecht Academic Medical Centre

5:15pm - 5:27pm

The impact of occupants' energy awareness and thermal preferences on buildings' performance

Florian Regnath¹, Christiane Berger², Ardeshir Mahdavi¹

¹Department of Building Physics and Building Ecology, TU Wien, Austria; ²Department of Architecture, Design and Media Technology, Aalborg University, Denmark

5:27pm - 5:39pm

Multi-zone Dynamic Simulations for Investigation of Occupant Behaviour and Building Performance

Elisa Venturi, Fabian Ochs, Mara Magni

Unit for Energy Efficient Buildings, University of Innsbruck, Austria

TD02: Parallel session Tuesday D02 (Energy)

Time: Tuesday, 24/May/2022: 4:15pm - 5:45pm · Location: Rotterdam B

Session Chair: Karel Kabele

4:15pm - 4:27pm

Optimal design and operation for heat prosumer-based district heating systems

Haoran Li, Juan Hou, Natasa Nord

Norwegian University of Science and Technology, Norway

4:27pm - 4:39pm

An aquifer thermal energy storage model for efficient simulations of district systems

Elisa Scalco^{1,2}, Angelo Zarrella², Alessandro Maccarini¹, Alireza Afshari¹

¹Department of the Built Environment, Aalborg University, Denmark; ²Department of Industrial Engineering, University of Padova, Italy

4:39pm - 4:51pm

NUMERICAL ANALYSIS OF A THERMAL ENERGY STORAGE TANK CHARGED WITH A FLAT TYPE SOLAR AIR COLLECTOR

Güven Hasret Yılmaz, Zeki Yılmazoğlu

Gazi University, Dept. of Mechanical Engr., Turkey

4:51pm - 5:03pm

Thermal performance of a supply-air window with triple heating glazing inserted in building envelope

Salem Zeiny, Yassine Cherif, Stephane Lassue, Thierry Chartier

Université d'Artois, France - LGCgE

5:03pm - 5:15pm

Hybrid photovoltaic-thermic system with enhanced cell energy efficiency

Marius Brănoaea, Andrei Burlacu, Marina Verdeș, Vasiliică Ciocan, Marius Costel Balan, Robert Ștefan Vizitiu

"Gheorghe Asachi" Technical University of Iasi-Romania, Faculty of Civil Engineering and Building Services, Romania

5:15pm - 5:27pm

Experimental and CFD comparison of driver's thermal plume with classical air diffusers

Amaury Jamin¹, Paul Alexandru Danca^{2,4}, Florin Bode^{2,3}, Ilinca Nastase²

¹Royal Military Academy (RMA), Belgium; ²CAMBI Research Center, Building Services Faculty, Technical University of Civil Engineering of Bucharest Bucharest, Romania; ³Department of Mechanical Engineering Technical University of Cluj Napoca Cluj Napoca, Romania; ⁴Department of Renewable Energy Sources National Institute for R&D in Electric Engineering ICPE-CA Bucharest, Romania

5:27pm - 5:39pm

Evaluation of Building Retrofitting Alternatives Towards Zero Energy School Building in Turkey

Ayşe Özlem Dal^{1,3}, Touraj Ashrafian^{2,3}

¹Ozyeğin University, Turkey; ²Ozyeğin University, Turkey; ³Building Materials and Physics Laboratory, Ozyeğin University, Turkey

5:39pm - 5:42pm

Assessment of Use Cases Involving Data from the Energy Performance Certification Process for Buildings - From Individual Buildings to Regional Scale

Gerfried Hans Cebret¹, Alessandra Manzini², Claudia Julius³

¹effiziente.st Energie- und Umweltconsulting e.U., Austria; ²Cleopa GmbH, Germany; ³SEnerCon, Germany

5:42pm - 5:45pm

Solar hybrid collectors analysis - Experimental and numerical study

Tiberiu Catalina, Ana Listarhov, Catalin Teodosiu, Razvan Popescu, Lelia Popescu, Catalin Lungu

UTCB - University, Romania

TD03: Parallel session Tuesday D03 (Health & Comfort - Modelling thermal comfort and overheating)

Time: Tuesday, 24/May/2022: 4:15pm - 5:45pm · Location: Dock 14
Session Chair: Lada Hensen Centnerová

4:15pm - 4:27pm

Ray-tracing MRT and human thermophysiology model combination for local discomfort prediction

Mohamad Rida¹, Miaomiao Hou^{2,3}, Arnab Chatterjee¹, Eric Teitelbaum⁴, Forrest Meggers⁴, Dorit Aviv², Dolaana Khovalyg¹

¹Thermal Engineering for the Built Environment (TEBEL), Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland; ²College of Architecture and Urban Planning, Tongji University, China; ³Thermal Architecture Lab (TAL), Weitzman School of Design, University of Pennsylvania, USA; ⁴CHAOS Lab, Andlinger Center for Energy and the Environment, Princeton University, Princeton, NJ, USA

4:27pm - 4:39pm

A Multi-Domain Approach to Explanatory and Predictive Thermal Comfort Modelling in Offices

Eugene Mamulova¹, Henk W. Brink^{1,2}, Marcel G. L. C. Loomans¹, Roel C. G. M. Loonen¹, Helianthe S. M. Kort¹

¹Eindhoven University of Technology, Eindhoven, The Netherlands; ²Hanze University of Applied Sciences, Groningen, The Netherlands

4:39pm - 4:51pm

Dynamic evaluation method for assessing households' thermal sensation using parametric statistical analysis: A longitudinal field study in the South-eastern Mediterranean climate

Hasim Altan¹, Bertug Ozariso²

¹Department of Architecture, Faculty of Design, Arkin University of Creative Arts and Design (ARUCAD), Cyprus; ²Graduate School, School of Architecture, Computing & Engineering, University of East London (UEL), United Kingdom

4:51pm - 5:03pm

Review on Overheating Evaluation Methods in National Building Codes in Western Europe

Ramin Rahif, Deepak Amaripadath, Shady Attia

Sustainable Building Design Lab, Dept. UEE, Faculty of Applied Science, Université de Liege, Belgium

5:03pm - 5:15pm

Impact of Spatial Distributions of Climate Condition on Building Overheating

Chang Shu¹, Abhishek Gaur², Liangzhu {Leon} Wang¹, Michal Bartko², Lili Ji¹, Abdelaziz Laouadi², Michael Lacasse²

¹Department of Building, Civil and Environmental Engineering, Concordia University, Montreal, 1455 De Maisonneuve, H3G 1M8, Montreal, Quebec, Canada; ²Construction Research Centre, National Research Council Canada 1200 Montreal Road, K1A 0R6, Ottawa, Ontario, Canada

5:15pm - 5:27pm

Energy and comfort in spaces equipped with ascendant airflow

Eusebio Conceição¹, João Gomes³, M^a Inês Conceição², M^a Manuela Lúcio¹, Hazim Awbi⁴

¹Universidade do Algarve, Portugal; ²Instituto Superior Técnico, Av. Rovisco Pais, 1049-001 Lisboa, Portugal; ³CINTAL, Campus de Gambelas, 8005-139 Faro, Portugal; ⁴School of Built Environment, University of Reading, Reading, RG6 6AW, United Kingdom

5:27pm - 5:39pm

Predicting indoor air temperatures by calibrating building thermal model with coupled airflow networks

Lili Ji¹, Chang Shu¹, Danlin Hou¹, Abdelaziz Laouadi², Liangzhu {Leon} Wang¹, Michael Lacasse²

¹Concordia University, Canada; ²National Research Council Canada, Ottawa, Canada

5:39pm - 5:42pm

Using ASHRAE Standard 55 Adaptive Comfort Method for Practical Applications

Peter Simmonds

Building and Systems Analytics, United Kingdom

5:42pm - 5:45pm

Simulated thermal comfort in renovated houses with low temperature heating

Victor Ghering¹, Paula van den Brom², Laure Itard², Roel Schipper²

¹ABT bv, Netherlands, The; ²TU Delft, Netherlands, The

TD04: Parallel session Tuesday D04 (Health & Comfort - Thermal perception)

Time: Tuesday, 24/May/2022: 4:15pm - 5:45pm · Location: Rotterdam D

Session Chair: Marcel Schweiker

4:15pm - 4:27pm

The relation between occupant's mood state and thermal sensation

Cihan Turhan¹, Neşe Alkan², Aydın Ege Çeter³, Mehmet Furkan Özbey^{3,4}

¹Atılım University, Energy Systems Engineering, Ankara, Turkey; ²Atılım University, Department of Psychology, Ankara, Turkey;

³Atılım University, Graduate School of Natural and Applied Science, Ankara, Turkey; ⁴Atılım University, Mechanical Engineering, Ankara, Turkey

4:27pm - 4:39pm

Thermal comfort perception and indoor climate: Results from the OPSCHALER project

Arjen Meijer, Anastasia Petropoulou, Andrea Iris Joseph Thaddeus, Laure Itard

Delft University of Technology, Netherlands, The

4:39pm - 4:51pm

The effect of thermal comfort conditions during work hours on social disconnection

Rania Christoforou¹, Hannah Pallubinsky^{1,2}, Janine Bardey^{1,4}, Kai Rewitz³, Mahmoud Elmokadem³, Tobias Burgholz^{3,4}, Dirk Müller^{3,4}, Marcel Schweiker¹

¹Research and Teaching Area Healthy Living Spaces, Institute for Occupational, Social and Environmental Medicine, Medical Faculty, RWTH Aachen University, Aachen, Germany; ²Department of Nutrition and Movement Sciences, School of Nutrition and Translational Metabolism Research (NUTRIM), Maastricht University, the Netherlands; ³Institute for Energy Efficient Buildings and Indoor Climate, E.ON Energy Research Center, RWTH Aachen University, Aachen, Germany; ⁴Heinz Trox Wissenschafts gGmbH, Aachen, Germany

4:51pm - 5:03pm

Exploring futures of summer comfort in Dutch households

Lenneke Kuijer, Lada Hensen Centnerová

Eindhoven University of technology, Netherlands, The

5:03pm - 5:15pm

Thermal Comfort in Old Traditional Shophouses in Ho Chi Minh City, Vietnam

Hung Thanh Dang

Ho Chi Minh City University of Architecture, Vietnam

5:15pm - 5:27pm

Thermal conditions and occupant satisfaction in energy retrofitted buildings in Finland

Virpi Leivo¹, Ulla Haverinen-Shaughnessy²

¹Tampere university, Finland; ²University of Oulu, Finland

5:27pm - 5:39pm

Crossed effects of visual factors on human thermal response

Roberta Jacoby Cureau¹, Mateus V. Bavaresco², Ilaria Pigliautile^{1,3}, Claudia Fabiani^{1,3}, Anna Laura Pisello^{1,3}

¹CIRIAF, Interuniversity Research Center on Pollution and Environment Mauro Felli, University of Perugia, Italy; ²Laboratory of Energy Efficiency in Buildings, Department of Civil Engineering, Federal University of Santa Catarina, Brazil; ³Department of Engineering, University of Perugia, Italy

5:39pm - 5:42pm

Comfort evaluation of a dynamic protective airflow system using human test subjects

Kim Harri Hagström¹, Ismo Alvar Grönvall¹, Petri Kalliomäki², Henna Maula², Arttu Sivula²

¹Halton Oy, Finland; ²Turku University of Applied Sciences, Finland

5:42pm - 5:45pm

Evaluation of students' perceptions and thermal comfort in London

Junpeng Lyu

ucl, United Kingdom

TD05: Parallel session Tuesday D05 (Digitization)

Time: Tuesday, 24/May/2022: 4:15pm - 5:45pm · Location: Dock 7
Session Chair: Lieve Maria Helsen

4:15pm - 4:27pm

FDD method for a variable-speed heat pump with natural refrigerants

Ivan Bellanco^{1,2}, Francisco Belío¹, Manel Valls², Raphael Gerber³, Jaume Salom¹

¹Catalonia Institute for Energy Research (IREC), Jardín de les Dones de Negre 1, Sant Adrià del Besòs (Barcelona), 08930, Spain;

²Universitat Rovira i Virgili, Department of Mechanical Engineering, Av. Països Catalans No. 26, Tarragona, 43007, Spain; ³Heim AG Heizsysteme, Wittenwilerstrasse 31, Aadorf, 8355 Switzzlerand

4:27pm - 4:39pm

Development of a remote refrigerant leakage detection system for chillers and VRFs

Michio Moriwaki, Manabu Yoshimi, Shohei Yamada, Takeshi Hikawa, Shunsuke Kimura, Shinichi Kasahara
Daikin Industries, Ltd., Japan

4:39pm - 4:51pm

Control device for pumping one-pipe hydronic systems

Jiří Dostál, Tomáš Baumelt, Jiří Cvrček

Czech Technical University in Prague, University Centre for Energy Efficient Buildings

4:51pm - 5:03pm

Co-benefits of building automation and control systems: an analysis of smart office buildings

Federico Garzia^{1,2}, Lotte Van Thillo², Stijn Verbeke^{2,3}, Cristian Pozza¹, Amaryllis Audenaert²

¹Institute for Renewable Energy, EURAC Research, Viale Druso 1, I-39100 Bolzano, Italy; ²Energy and Materials in Infrastructure and Buildings, University of Antwerp, Faculty of Applied Engineering, Groenenborgerlaan 171, 2020, Antwerp, Belgium; ³Unit Smart Energy and Built Environment, VITO, Boeretang 200, 2400, Mol, Belgium

5:03pm - 5:15pm

Reinforcement learning for occupant-centric operation of residential energy system: Evaluating the adaptation potential to the unusual occupants' behavior during COVID-19 pandemic

Amirreza Heidari, François Maréchal, Dolaana Khovalyg

School of Architecture, Civil and Environmental Engineering (ENAC), Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland

5:15pm - 5:27pm

Data Integrity Checks for Building Automation and Control Systems

Markus Gwerder¹, Reto Marek², Andreas Melillo², Maria Husmann¹

¹Siemens Switzerland Ltd., Zug, Switzerland; ²Lucerne school of engineering and architecture, Horw, Switzerland

5:27pm - 5:39pm

Predict the remaining useful life in HVAC filters using a hybrid strategy

Hossein Alimohammadi¹, Kristina Vassiljeva¹, Eduard Petlenkov¹, Tuule Mall Kull², Martin Thalfeldt^{https}²

¹Department of Computer Systems, Tallinn University of Technology, Tallinn, Estonia; ²Department of Civil Engineering and Architecture, Tallinn University of Technology, Tallinn, Estonia

5:39pm - 5:42pm

Real-time diagnostic tool for hygienic and energy parameters of air handling components

Christian Friebe, Thomas Oppelt, Hannes Rosenbaum

ILK Dresden, Germany

5:42pm - 5:45pm

Digital Twin as energy management tool through IoT and BIM data integration

Alice Schweigkofler¹, Orjola Braholli¹, Sylvia Akro⁴, Dietmar Siegele¹, Paola Penna¹, Carmen Marcher¹, Lavinia Chiara Tagliabue³, Dominik T. Matt^{1,2}

¹Fraunhofer Italia, Via A. Volta 13 A, 39100 Bolzano, Italy; ²Free University of Bozen-Bolzano, Piazza Università 5, 39100 Bolzano, Italy; ³University of Turin, Dipartimento di Architettura, Ingegneria delle Costruzioni e Ambiente Costruito, Via G.Verdi, 8, 10124 Torino, Italy; ⁴Politecnico di Milano, Dipartimento ABC, Piazza Leonardo da Vinci, 32, 20133 Milano MI, Italy

TD06: Parallel session Tuesday D06 (Learning & Education)

Time: Tuesday, 24/May/2022: 4:15pm - 5:45pm · Location: Dock 6

Session Chair: Roel Loonen

4:15pm - 4:27pm

Reflections on flipped classroom and digitized laboratory concept in building automation courses

Jochen Müller, Wilfried Hutmacher

TH Köln, Germany

4:27pm - 4:39pm

Learning and Knowledge Transfer of Professionals within the Building Services Sector

Mohammad Samir Ahmed¹, Joep Van der Velden⁴, Paula Van den Brom², Ali Soleymani², Maaïke Konings³, Laure Itard²,
Marcus Specht², Ellen Sjoer³, Wim Zeiler¹

¹TU Eindhoven; ²TU Delft; ³The Hague University of Applied Sciences; ⁴Kropman Installatietechniek

4:39pm - 4:51pm

Using Social Network Analysis to explore Learning networks in MOOCs discussion forums

Ali Soleymani¹, Laure Itard¹, Maarten De Laat², Manuel Valle Torre¹, Marcus Specht¹

¹Delft University of Technology; ²University of South Australia

4:51pm - 5:03pm

A structured approach to online education of future HVAC and energy professionals

Laure Itard, Philomena Bluysen, Paula van den Brom

Delft University of technology, Netherlands, The

5:03pm - 5:15pm

Digital Erasmus – a pan-European approach to teaching building performance and resilient design

Christina J. Hopfe¹, Eleonora Brembilla², Lori McElroy³, Robert S. McLeod¹, Matej Gustin¹, Daniel Costola³

¹TU Graz, Austria; ²TU Delft, Netherlands; ³Strathclyde University, UK

5:15pm - 5:27pm

A New Learning Programme to Facilitate nZEB Implementation

Mihnea Sandu¹, Horia Petran², Cristiana Croitoru¹, Florin Bode¹, Ilinca Nastase¹

¹UTCB, Romania; ²INCERC, Romania

5:27pm - 5:39pm Warning: The presentations finish prior to the end of the session!

Closing the Knowledge Gap on Circularity: the CBE Hub Lifelong Education Programmes

Olga Ioannou, Tillmann Klein

TU Delft Faculty of Architecture and the Built Environment, Netherlands, The

WA01: Parallel session Wednesday A01 (Energy)

Time: Wednesday, 25/May/2022: 9:30am - 10:30am · Location: Rotterdam B
Session Chair: Roel Loonen

9:30am - 9:42am

Energy consumption patterns in a hotel building – A case study

Klaudia Zwolińska¹, Marcin Czerwiński², Marek Borowski¹

¹AGH University of Science and Technology, Poland; ²Frapol Sp. z o.o., 30-832 Kraków, Poland

9:42am - 9:54am

Transparent dynamic insulation: a novel system combining ventilation and insulation for sustainable greenhouse applications

Arjan Frijns, Bert van Schaijk

Eindhoven University of Technology, the Netherlands

9:54am - 10:06am

Energy performance retrofits targeting national strategy development for typical Turkish school building

Hazal Kızıldağ^{1,3}, Gökçe Tomrukcu^{1,3}, Gizem Avgan^{1,3}, Ayşe Özlem Dal^{1,3}, Neşe Ganiç Sağlam^{2,3}, Ece Kalaycıoğlu Özdemir^{2,3},
Touraj Ashrafian^{2,3}

¹Graduate School of Engineering and Science, Department of Architecture, Ozyegin University, Istanbul, Turkey; ²Faculty of Architecture and Design, Department of Architecture, Ozyegin University, Istanbul, Turkey; ³Building Materials and Physics Laboratory, Ozyegin University, Istanbul, Turkey

10:06am - 10:18am

Validation process of energy performance simulation: A Turkish school building case

Gökçe Tomrukcu^{1,3}, Hazal Kızıldağ^{1,3}, Gizem Avgan^{1,3}, Ayşe Özlem Dal^{1,3}, Neşe Ganiç Sağlam^{2,3}, Ece Kalaycıoğlu Özdemir^{2,3},
Touraj Ashrafian^{2,3}

¹Graduate School of Engineering and Science, Department of Architecture, Ozyegin University, Istanbul, Turkey; ²Faculty of Architecture and Design, Department of Architecture, Ozyegin University, Istanbul, Turkey; ³Building Materials and Physics Laboratory, Ozyegin University, Istanbul, Turkey

10:18am - 10:30am

Bioclimatic Design and Advanced Strategies' Impacts on Energy Performance of Residential Buildings

Gizem Avgan^{1,3}, Touraj Ashrafian^{2,3}

¹Graduate School of Engineering and Science, Department of Architecture, Ozyegin University, Istanbul, Turkey; ²Faculty of Architecture and Design, Department of Architecture, Ozyegin University, Istanbul, Turkey; ³Building Materials and Physics Laboratory, Ozyegin University, Turkey

WA02: Parallel session Wednesday A02 (Energy)

Time: Wednesday, 25/May/2022: 9:30am - 10:30am · Location: Dock 14

Session Chair: Christian Struck

9:30am - 9:42am

Flexibility deployment of a heating system with heat pump in residential towers

Beatrix Rozalinde Anna Bos¹, Pieter-Jan Hoes¹, Jan Hensen¹, Ingrid van Prooijen², Christina Papachristou²

¹Eindhoven University of Technology, Netherlands, The; ²Royal BAM group

9:42am - 9:54am

Renewables the frontiers towards low carbon resilience – Are they shaping the landscapes of Energy Markets ?

Dr. Prachi Ugle Pimpalkhute

ESDW2021- ESDW European Wide Initiative Organizer, Lead and Mentor for Mission De Facto Cities and Communities, Founder and Climate Change Crusader Eco Endeavourers Network, IUCN Union Commission Member Environmental Management, SPP Sustainable Procurement, United Kingdom

9:54am - 10:06am

Evaluation of the intrinsic thermal performance of an envelope in hot period. Outdoor experiment at a 40m³ test cell

Arnaud Jay, Marie Tanchou, Hafsa Fares, Jocelyn Anger

Univ. Grenoble Alpes, CEA, Liten, ITE INES.2S, 73375 Le Bourget du Lac, France

10:06am - 10:18am

Methodology for the development of temporally high-resolved and spatially accurate tapping profiles

Mark Distelhoff, Peter Pärtsch, Carsten Lampe

Institut für Solarenergieforschung GmbH (ISFH), Germany

10:18am - 10:30am

NUMERICAL INVESTIGATION OF AN EVACUATED TUBE SOLAR COLLECTOR IN A SOLAR ASSISTED ROOFTOP UNIT

Tunahan Akis¹, Orhan Ekren¹, Kerim Gümrükçüler²

¹Ege University, Solar Energy Institute, İzmir Turkey; ²İmbat Air Conditioning and Cooling Systems Inc., İzmir Turkey

WA03: Parallel session Wednesday A03 (Health & Comfort - Schools I)

Time: Wednesday, 25/May/2022: 9:30am - 10:30am · Location: Rotterdam D

Session Chair: Wim Zeiler

9:30am - 9:42am

Effects of supply air temperature and pollutant location on concentration characteristics with a night-time ventilation in a school classroom

Sami Lestinen¹, Panu Mustakallio², Risto Kosonen^{1,3}, Simo Kilpeläinen¹, Juha Jokisalo¹

¹Aalto University, Espoo, Finland; ²Halton Oy, Kausala, Finland; ³Nanjing Tech University, Nanjing, China

9:42am - 9:54am

Evaluation of the ventilation situation in Dutch schools using the QuickScan method

Vinayak Krishnan, Marcel Loomans, Shalika Walker, Wim Zeiler

Eindhoven University of Technology, Netherlands, The

9:54am - 10:06am

Ventilation and air conditioning for school buildings

Pavol Štefanič, Zuzana Straková

Slovak University of Technology in Bratislava, Slovak Republic

10:06am - 10:18am

Impact of night-time ventilation on indoor air quality in kindergartens and schools

Simo Kilpeläinen¹, Sami Lestinen¹, Risto Kosonen^{1,2}, Maria Valkonen³, Juha Jokisalo¹

¹Aalto University, Espoo, Finland; ²Nanjing Tech University, Nanjing, China; ³Finnish Institute for Health and Welfare (THL), Kuopio, Finland

10:18am - 10:30am

Assessment of the Indoor Environment Quality in UM6P Classrooms

Houda Er-retby¹, Abdelkader El Kounni¹, Bouthayna Idrissi Gartoumi¹, Manuel Carlos Gameiro Da Silva², Brahim Benhamou³, Hassan Radoine¹, Hicham Mastouri¹

¹Mohammed VI Polytechnic University, Morocco; ²Coimbra University; ³Cadi Ayyad University

WA04: Parallel session Wednesday A04 (Health & Comfort - CFD and building simulation)

Time: Wednesday, 25/May/2022: 9:30am - 10:30am · Location: Dock 7

Session Chair: Arjen Meijer

9:30am - 9:42am

Relationship between bioaerosol particle size and ventilation removal for airborne infections

Yuta Muto, Sihwan Lee, Jaeung Hwang

Shinshu University, Japan

9:42am - 9:54am

Towards the integration of air chemistry and building simulation models IAQ assessment

Jeroen Antonius Nicholas van 't Ende^{1,2}, Mihalis Lazaridis¹, Christian Struck², Annemarie Weersink²

¹Saxion, Netherlands, The; ²Technical University of Crete, Greece

9:54am - 10:06am

Comparing Fast Numerical Methods and Conventional CFD for Mixing Ventilation Flows

Eugene Mamulova, Twan van Hooff

Department of the Built Environment, Eindhoven University of Technology, Eindhoven, The Netherlands

10:06am - 10:18am

Simulating indoor air quality in London hospitals: A building-based bottom-up method

Shih-Che Hsu¹, Ian Hamilton¹, Anna Mavrogianni², Rob Liddiard¹

¹UCL Energy Institute, United Kingdom; ²UCL Institute for Environmental Design and Engineering, United Kingdom

WA05: Parallel session Wednesday A05 (Digitization)

Time: Wednesday, 25/May/2022: 9:30am - 10:30am · *Location:* Dock 11

Session Chair: Christian Anker Hviid

9:30am - 9:42am

Mapping of an abstract PLC information model into different fields of application

Björn Kämper, Maximilian Both, Nicolai Maisch, Jochen Müller

Cologne University of Applied Sciences

9:42am - 9:54am

Improving the Calibration on Building Stock Level method by Comparing objective functions and optimization algorithms

Paula Van den Brom, Samuel Smets, Laure Itard

Delft University of Technology, Netherlands, The

9:54am - 10:06am

A Reference Architecture for Data-Driven Smart Buildings Using Brick and LBD Ontologies

Pieter Pauwels¹, Gabe Fierro²

¹Eindhoven University of Technology, Netherlands; ²Colorado School of Mines, Colorado, US

10:06am - 10:18am

From BIM databases to Modelica - Automated simulations of heating systems

Esben Visby Fjorbæk¹, Mikki Seidenschnur^{1,2}, Ali Küçükavcı^{1,3}, Kevin Michael Smith¹, Christian Anker Hviid¹

¹Department of Civil Engineering, Technical University of Denmark, Denmark; ²Ramboll, Denmark; ³Cowi, Denmark

10:18am - 10:30am

Impact of Traditional Augmentation Methods on Window State Detection

Seunghyeon Wang, Ivan Korolija, Dimitrios Rovas

UCL, United Kingdom

WB01: Parallel session Wednesday B01 (Energy)

Time: Wednesday, 25/May/2022: 11:00am - 12:30pm · *Location:* Rotterdam B
Session Chair: Wim Maassen

11:00am - 11:12am

Life cycle analysis of warehouse-type constructions

Ionut Iancu, Ligia Moga

Technical University of Cluj Napoca, Romania

11:12am - 11:24am

Going active: How do people envision the next generation of buildings?

Elli Nikolaidou¹, Ian Walker², David Coley¹, Stephen Allen¹, Daniel Fosas³

¹University of Bath, United Kingdom; ²University of Surrey, United Kingdom; ³University of Edinburgh, United Kingdom

11:24am - 11:36am

Evaluation Dutch final nZEB requirements for University buildings

Mike van Osta¹, Wim Maassen^{1,2}

¹Royal HaskoningDHV, Netherlands, The; ²Eindhoven University of Technology

11:36am - 11:48am

Monitoring a deep energy renovated building

Matthias Haase

ZHAW

11:48am - 12:00pm

Optimal dispatch strategy for building aggregators to fully utilize the energy flexibilities

Hong Tang¹, Shengwei Wang^{1,2}

¹Department of Building Environment and Energy Engineering, The Hong Kong Polytechnic University, Hong Kong S.A.R. (China);
²Research Institute of Smart Energy, The Hong Kong Polytechnic University, Hong Kong S.A.R. (China)

12:00pm - 12:12pm

Intelligent building envelope solutions in Finnish new and old apartment buildings

Azin Velashjerdi Farahani¹, Juha Jokisalo^{1,2}, Natalia Korhonen³, Kirsti Jyrha³, Heikki Ihasalo¹, Jaakko Ketomaki¹, Risto Kosonen^{1,2,4}

¹Aalto University, Finland; ²Smart City Center of Excellence, TalTech, Estonia; ³Finnish Meteorological Institute, Finland; ⁴Nanjing Tech University, China

WB02: Parallel session Wednesday B02 (Energy)

Time: Wednesday, 25/May/2022: 11:00am - 12:30pm · Location: Dock 14

Session Chair: Jaap Hogeling

11:00am - 11:12am

'Power gap' in Heat Load calculations – EN12831-1 versus monitoring and simulation results

Paul Van den Bossche¹, Jeroen Van der Veken¹, Sébastien Pecceu¹, Sara Verheyleweghen¹, Stijn Verbeke²

¹BBRI, HVAC lab, Belgium; ²EMIB, UAntwerpen, Belgium

11:12am - 11:24am

Evaluation of tariff structural changes in Spanish households affected by energy poverty

Mariana Catalina Jiménez Martínez¹, Joana Aina Ortiz Ferrà¹, Lluç Canals Casals^{1,2}

¹Catalonia Energy Research Institute (IREC), Spain; ²Universitat Politècnica de Catalunya(UPC), Spain

11:24am - 11:36am

Next-Generation Energy Performance Certificates. What novel implementation do we need?

Lina Seduikyte¹, Phoebe-Zoe Morsink-Georgali², Christiana Panteli³, Panagiota Chatzipanagiotidou⁴, Stavros Koltsios⁴, Ioannidis Dimosthenis⁴, Laura Stasiulienė¹, Paulius Spūdys¹, Darius Pupeikis¹, Andrius Jurelionis¹, Paris Fokaides²

¹Kaunas University of Technology, Lithuania; ²Frederick Research Center, Cyprus; ³Cleopa GmbH, Germany; ⁴Centre for Research and Technology Hellas, Information Technologies Institute, Greece

11:36am - 11:48am

A common European EPB Assessment and Certification scheme. U-CERT's proposal

Pablo Carnero¹, Dick van Dijk², Niccolò Mignani³, Gabriela Adriana Ana²

¹Instituto Valenciano de la Edificación, Spain; ²Energy Performance of Buildings (EPB) Center; ³Alma Mater Studiorum Università di Bologna

11:48am - 12:00pm

New forecast control of heat for heating

Tomasz Cholewa, Alicja Siuta-Olcha, Piotr Wolszczak, Andrzej Smolarz, Piotr Muryjas, Łukasz Guz, Martyna Bocian

Lublin University of Technology, Poland

12:00pm - 12:12pm

Potential of WASTE WATER HEAT RECOVERY SYSTEMS in reducing the energy demand

Pavel Sevela, Johannes Frenger

University of Innsbruck, Unit of Energy Efficient Building

12:12pm - 12:15pm

Ecological Refrigerant Cascade Systems Replacement in Accordance with the EU Regulations

Tarlea Gratiela-Maria^{1,2}, Vinceriu Mioara^{1,2}, Ionescu Temistocle^{1,2}

¹UTCB, Romania; ²AGFR, Romania

WB03: Parallel session Wednesday B03 (Health & Comfort - Schools II)

Time: Wednesday, 25/May/2022: 11:00am - 12:30pm · Location: Rotterdam D
Session Chair: Dadi Zhang

11:00am - 11:12am

Perceived and measured indoor environment in educational buildings

Tuomo Ojanen, Esa Nykänen, Teemu Vesanen
VTT Technical Research Centre of Finland Ltd, Finland

11:12am - 11:24am

Development of the TAIL rating scheme for indoor environmental quality in schools

Minh Tien-Tran^{2,3}, Wenjuan Wei², Claire Dassonville², Corinne Mandin², Pawel Wargocki¹, Valerie Hequet³
¹DTU Civil Engineering, Denmark; ²French Indoor Air Quality Observatory (OQAI), Health and Comfort Department, Scientific and Technical Center for Building (CSTB), France; ³GEPEA IMT Atlantique, France

11:24am - 11:36am

Visualisation of the airflow pattern of exhaled droplets in a classroom

Yat Long Liu, Marco A. Ortiz, Dadi Zhang, Philomena M. Bluysen
TU Delft, Netherlands, The

11:36am - 11:48am

Learning from innovative climate concepts in schools

Stijn van der Horst, Froukje van Dijken
bba binnenmilieu, Netherlands, The

11:48am - 12:00pm

Baby beds' sleep micro-environment in day care centres

Wim Zeiler
TU Eindhoven, Netherlands, The

12:00pm - 12:12pm

CO2 monitoring to assess ventilation rate: practical suggestions from a laboratory study

Dadi Zhang, Er Ding, Philomena Bluysen
Delft University of Technology, Delft, the Netherlands

12:12pm - 12:24pm

Ventilation and COVID-19 transmission risks on board of Dutch governmental ships

Atze Boerstra^{1,2}, Mark Verlinde¹, Sander Wander³
¹bba binnenmilieu; ²Delft University of Technology; ³Directorate for Public Works and Water Management

12:24pm - 12:27pm

Improving the indoor / outdoor ratio of (ultra)fine particles in a school

Froukje van Dijken¹, Marije te Kulve¹, Bob Ursem²
¹bba binnenmilieu; ²Delft University of Technology

12:27pm - 12:30pm

Natural indoor climate in St. Charles Borromeo chapel in Telc

Ondřej Hnilica¹, Stefan Bichlmair², Tomáš Fečér³, Josef Plášek³
¹Czech Academy of Sciences, Institute of History, Czech Republic; ²Fraunhofer Institute for Building Physics IBP, Holzkirchen Branch, Germany; ³Brno University of Technology, Faculty of Civil Engineering, Czech Republic

WB04: Parallel session Wednesday B04 (Health & Comfort - Sleep quality)

Time: Wednesday, 25/May/2022: 11:00am - 12:30pm · Location: Dock 7
Session Chair: Chenxi Liao

11:00am - 11:12am

Control of the bed thermal environment by a ventilated mattress: human subject response

Ge Song¹, Mariya Petrova Bivolarova², Guoqiang Zhang¹, Arsen Krikor Melikov²

¹Hunan University, China; ²Technical University of Denmark, Denmark

11:12am - 11:24am

Control of the bed thermal environment by a ventilated mattress

Rinsa Kunnathummal, Mariya Petrova Bivolarova, Arsen Krikor Melikov

Technical University of Denmark, Denmark

11:24am - 11:36am

Importance and design of ventilation for an improved sleep quality

Nur Çobanoğlu¹, Ziya Haktan Karadeniz², Sait Cemil Sofuoğlu³, Macit Toksoy⁴

¹Graduate School of Natural and Applied Sciences, İzmir Kâtip Çelebi University, İzmir, Turkey; ²Department of Energy Systems Engineering, İzmir Institute of Technology, İzmir, Turkey; ³Department of Environmental Engineering, İzmir Institute of Technology, İzmir, Turkey; ⁴RD&PM

11:36am - 11:48am

Development of a human body thermo-physiological model considering the effect of gravity on blood

Hiroya Azemachi¹, Atushi Ohi¹, Riku Emoto², Hideaki Nagano¹, Suguru Shiratori¹, Kenjiro Shimano¹

¹Tokyo city university, Japan; ²Graduate school of Tokyo city university, Japan

11:48am - 12:00pm

Cooling effects on fatigue recovery during summer sleep

Noriko Umemiya, Mitsunori Suzuki

Osaka City University

12:00pm - 12:12pm

Effects of airing behaviours on bedroom air pollutants during sleep

Chenxi Liao^{1,2}, Xiaojun Fan², Mariya Petrova Bivolarova², Anna Mainka³, Chandra Sekhar⁴, Jelle Laverge¹, Li Lan⁵, Mizuho Akimoto⁶, Pawel Wargocki²

¹Department of Architecture and Urban Planning, Ghent University, Belgium; ²Department of Environmental and Resource Engineering, Technical University of Denmark, Denmark; ³Department of Air Protection, Faculty of Energy and Environmental Engineering, Silesian University of Technology, Poland; ⁴Department of the Built Environment, National University of Singapore, Singapore; ⁵Department of Architecture, School of Design, Shanghai Jiao Tong University, Shanghai, China; ⁶Department of Architecture, Waseda University, Japan

12:12pm - 12:24pm

Air change rates during sleep in Danish bedrooms

Xiaojun Fan¹, Chenxi Liao², Mariya Petrova Bivolarova¹, Anna Mainka³, Chandra Sekhar⁴, Jelle Laverge², Li Lan⁵, Mizuho Akimoto⁶, Pawel Wargocki¹

¹International Centre for Indoor Environment and Energy, Technical University of Denmark, Lyngby, Denmark; ²Research Group of Building Physics, Construction, and Climate Control, Department of Architecture and Urban Planning, Ghent University, Ghent, Belgium; ³Department of Air Protection, Faculty of Energy and Environmental Engineering, Silesian University of Technology, Silesian, Poland; ⁴Department of the Built Environment, National University of Singapore, Kent Ridge, Singapore; ⁵Department of Architecture, School of Design, Shanghai Jiao Tong University, Shanghai, China; ⁶Department of Architecture, Waseda University, Tokyo, Japan

WB05: Parallel session Wednesday B05 (Digitization)

Time: Wednesday, 25/May/2022: 11:00am - 12:30pm · Location: Dock 11

Session Chair: Pieter-Jan Hoes

11:00am - 11:12am

Deep learning for CFD analysis in built environment applications: a review

Giovanni Calzolari, Wei Liu

KTH Royal Institute of Technology, Stockholm, Sweden

11:12am - 11:24am

CONVERGE: low energy with active passiveness in a transparent highly occupied building

Peter van den Engel, Regina Bokel, Luigi de Araujo Passos, Eleonora Brembilla, Peter Luscuere

Delft University of Technology, Netherlands, The

11:24am - 11:36am

Effect of measurement resolution on data-based models of thermodynamic behaviour of buildings

Thea Hauge Broholt, Louise Rævdal Lund Christensen, Steffen Petersen

Aarhus University, Denmark

11:36am - 11:48am

Assessment of energy and business performance of innovative technologies in SMEs

Pieter Proot¹, Ad Breukel², Jeroen Lippens¹, Hugo de Moor², Hilde Breesch¹

¹KU Leuven, Department of Civil Engineering, Building Physics and Sustainable Design, Ghent, Belgium; ²Avans University of Applied Science, Research Group Smart Energy, 's-Hertogenbosch, The Netherlands

11:48am - 12:00pm

A novel machine learning approach to predict short-term energy load for future low-temperature district heating

Thomas Ohlson Timoudas^{1,4}, Yiyu Ding², Qian Wang^{1,3}

¹KTH Royal Institute of Technology; ²NTNU: Norwegian University of Science and Technology; ³Uponor AB; ⁴RISE Research Institutes of Sweden

12:00pm - 12:12pm

domOS: an "Operating System" for Smart Buildings

Junior Dongo², Dominique Gabioud¹, Amir Laadhar², Martin Meyer¹, Christian Thomsen², Frédéric Revaz¹, Brian Nielsen²

¹Institute of Sustainable Energy, School of Engineering, University of Applied Sciences Western Switzerland Valais, Sion, Switzerland; ²Department of Computer Science, Aalborg University, Aalborg, Denmark

12:12pm - 12:24pm

A web-based approach to BMS, BIM and IoT integration: a case study

Lasitha Chamari, Ekaterina Petrova, Pieter Pauwels

Technology University, Eindhoven, Netherlands, The

12:24pm - 12:27pm

4S3F Diagnostic Bayesian Network method: discussion about application and technical design

Ziao Wang, Laure Itard, Arjen Meijer

TU Delft, Netherlands

12:27pm - 12:30pm

Fault detection in district heating substations: a cluster-based and an instance-based approach

Jad Al Koussa^{1,2}, Sara Månsson^{1,2,3,4}

¹VITO, Boeretang 200, BE-2400 MOL, Belgium; ²EnergyVille, Thor Park 8310, BE-3600, Genk, Belgium; ³Department of Energy Sciences, Faculty of Engineering, Lund University, P.O. Box 118, SE-221 00 Lund, Sweden; ⁴current affiliation: Utilifeed, Stora Badhusgatan 18-20 - 411 21 Gothenburg - Sweden

WB06: Parallel session Wednesday B06 (Digitization)

Time: Wednesday, 25/May/2022: 11:00am - 12:30pm · Location: Dock 12

Session Chair: Stijn Verbeke

11:00am - 11:12am

Automated performance monitoring of HVAC components by artificial intelligence

Maximilian Both¹, Nicolai Maisch¹, Björn Kämper¹, Alina Cartus¹, Jochen Müller¹, Christian Diedrich²

¹Technische Hochschule Köln, Germany; ²Otto-von-Guericke-Universität Magdeburg, Germany

11:12am - 11:24am

Transient analysis of individual return temperatures in hydronic floor heating systems

Simon Thorsteinsson¹, Henrik Lund Stærmose², Jan Dimon Bendtsen¹

¹Aalborg University, Denmark; ²Neogrid Technologies ApS, Denmark

11:24am - 11:36am

Health monitoring: a machine learning approach for anomaly detection in multi-sensor networks

Bram Hajee¹, Kees Wisse¹, Peyman Mohajerin Esfahani²

¹DWA, The Netherlands; ²Delft Center for Systems and Control, Delft University of Technology

11:36am - 11:48am

Assessment of fouling in plate heat exchangers using classification machine learning algorithms

Sevit Ahmet Kuzucanli¹, Ceren Vatanserver¹, Alp Emre Yaşar¹, Ziya Haktan Karadeniz²

¹Department of Hydraulic Module R&D, Bosch Thermotechnology, 45030 Manisa, Turkey; ²Department of Energy Systems Engineering, Izmir Institute of Technology, Izmir, Turkey

11:48am - 12:00pm

Automated energy performance diagnosis of HVAC systems by the 4S3F method

Laure Itard¹, Arie Taa²

¹Delft University of technology, Netherlands, The; ²The Hague University of Applied Sciences

12:00pm - 12:12pm

Interactive GUI for enhancing user awareness applying IoT-sensors and physics-assisted AI

Dietmar Siegele¹, Paola Penna¹, Alice Schweigkofler¹, Orjola Braholli¹, Michael Riedl¹, Dominik T. Matt^{1,2}

¹Fraunhofer Italia, Via A. Volta 13 A, 39100 Bolzano, Italy; ²Free University of Bozen-Bolzano, Piazza Università 5, 39100 Bolzano, Italy

12:12pm - 12:24pm

Response of low-cost environmental monitors to typical emission events in daycare centers

Hailin Zheng, Marcel Loomans, Shalika Walker, Wim Zeiler

Eindhoven University of Technology, Netherlands, The

12:24pm - 12:27pm

Placement and utilization of CO2 measurements in the ventilation and occupancy assessments

Antti Makinen, Jussi-Pekka Juvela, Sampo Saari, Sakari Uusitalo, Leila Kakko

Tampere University of Applied Sciences, Finland

12:27pm - 12:30pm

Quality requirements for forecasts in HVAC operation optimization

Thomas Oppelt

ILK Dresden, Germany