Annelies Vandersickel

Born on April 19, 1984 • Belgian Citizen

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Work Experience

2019 - present **Chair of Working Group Thermal Energy Storage,**
ProcessNett – an initiative of Dechema and VDI-GVC, Germany

The Thermal Energy Storage group identifies use-cases for thermal storage in buildings, industrial processes and power plant applications by connecting research and industry and provides recommendations to policy makers.

2014 - present **Group Lead Thermal Storage and integrated Energy Concepts,**
Institute for Energy Systems, TUM, Germany

Scientific lead of 7 PhD Students focusing on:

- Development, assessment and optimization of thermal energy (storage) systems for industry, thermal power plant and waste heat applications.
- Innovative energy concepts with integrated electricity, heating and cooling.

Research and project management including coordination of industrial partners, acquisition of relevant projects and third-party funding (2.5 Mio € since 2014), and networking with the relevant players in industry, academia and politics.

Leadership of the interdisciplinary cluster Project - CleanTechCampus Innovative Energy concepts for the TUM Campus in Garching, managing multiple stakeholders from research institutes (team of 11) to state ministries.

Teaching and independent lecture development (electricity and heat storage, renewable energy technology, thermodynamics in energy conversion)

6/2017 – 4/2018 & 1/2020 – Present: Parental Leave

2012-2013 **Postdoctoral Associate, Energy System Optimization Lab (Prof. Mitsos), Massachusetts Institute of Technology (MIT), Boston, USA**

Modeling and optimization of new conceptual designs for a variety of energy systems in collaboration with industrial partners, including an integrated thermal solar receiver/storage tank as well as a novel CaO-based energy storage system.

2011 **Postdoctoral Associate, Aerothermochemistry and Combustion Systems Laboratory, ETH Zurich, Switzerland**

2008-2011 **Research Assistant, Aerothermochemistry and Combustion Systems Laboratory (LAV), ETH Zurich, Switzerland**

- Developed and implemented global ignition models for HCCI combustion in Fortran and matlab and coupled the developed models with optimization resp. CFD code.
- Co-authored a successful funding application for the continuation project.

Education

	TU München, Zertifikat Hochschullehre Bayern Vertiefungsstufe (2018-2020)
PhD	**LAV, ETH Zurich, Switzerland, mechanical engineering (2007 – 2011)** Supervisor: Professor Konstantinos Boulouchos • Thesis: 'Two Approaches to Auto-ignition Modelling for HCCI Applications' • **awarded with the Kamm-Jante Medal for the best dissertation in the German-speaking world within the field of combustion engines (2012)**
M.Sc. & B.Sc.	**K.U.Leuven, Belgium, mechanical engineering – focus thermal energy (2002 – 2007)** • **Graduated Magna Cum Laude** • Master Thesis: 'Physical and numerical Modeling of the Chartherm reactor for the carbonization of preservative impregnated wood waste'

Further Activities & Achievements

2020	Offer for a „Professorship (W3) Conversion technologies for renewable energies" at the Hamburg University of Technology
2019 – present	**Mentor for the FeelScience Program of the University of Stuttgart** Mentoring-Program for female Students and Researchers
2017 - 2019	**Invited Speaker at:** • VDI-GEU Thermodynamik-Kolloquium 2019 • Heat Powered Cycles Conference 2018 • Swiss Symposium Thermal Energy Storage 2017
2014 - present	**Selected professional development:** • 2020 – BWL Grundlagen für Ihre Führungsstrategie (Dr. Mößmer, BMW) • 2015 – Personnel management (Mitarbeiterführung – Grundkurs, TU München) • 2015 – Project Management Compact (TU München) • 2014 – Moderation techniques (TU München)
2014-2016	**Project Lead at Engineers without Borders** (Cooking from waste - leading volunteers)
2014	**Received the TUM Research Foundation Fellowship**

Scientific and Professional Societies

- International Energy Agency – Energy Conservation through Energy Storage (Annex 30 & 33)
- Verein der Deutsche Ingenieure (VDI) / VDI-Gesellschaft Verfahrenstechnik und Chemieingenieurwesen (VDI-GVC)
- Gesellschaft für chemische Technik & Biotechnology (Dechema)
- ProcessNett - Arbeitsausschuss Thermische Energiespeicherung

Publication List

Peer Reviewed Publications

2020

- ***A. Vandersickel,*** *W. Wedel, H. Spliethoff*, High temperature heat and water recovery in steam injected gas turbines using an open absorption heat pump, Applied Thermal Engineering 165, 2020

2019

- *W. Wedel,* ***A. Vandersickel,*** *H. Spliethoff*, Benchmarking and Potential of Heat Pumps for Flue Gas Condensation, International Journal of Thermodynamics 22(3):168-175

- *W. Wedel, Hanel, A., H. Spliethoff,* ***A. Vandersickel,*** Improving information gain from optimization problems using artificial neural networks, ECOS 2019 - Proceedings of the 31st International Conference on Efficiency, Cost, Optimisation, Simulation and Environmental Impact of Energy Systems, 2019

- *Ostermeier, P.;* ***Vandersickel, A****.; Gleis, S.; Spliethoff, H.:* Numerical Approaches for Modeling Gas–Solid Fluidized Bed Reactors: Comparison of Models and Application to Different Technical Problems. Journal of Energy Resources Technology 141 (7), 2019

- *Ostermeier, P.; DeYoung, S.;* ***Vandersickel, A.;*** *Gleis, S.; Spliethoff, H.:* Comprehensive investigation and comparison of TFM, DenseDPM and CFD-DEM for dense fluidized beds. Chemical Engineering Science 196, 2019, 291-309

2018

- *Angerer, M.; Becker, M.; Härzschel, S.; Kröper, K.; Gleis, S.;* ***Vandersickel, A****.; Spliethoff, H.:* Design of a MW-scale thermo-chemical energy storage reactor. Energy Reports 4, 2018, 507-519

- *Ostermeier, P.; Dawo, F.;* ***Vandersickel, A****.; Gleis, S.; Spliethoff, H.*: Numerical calculation of wall-to-bed heat transfer coefficients in Geldart B bubbling fluidized beds with immersed horizontal tubes. Powder Technology 333, 2018, 193-208

- *Ostermeier, P.;* ***Vandersickel, A****.; Becker, M.; Gleis, S.; Spliethoff, H*.: Hydrodynamics and heat transfer around a horizontal tube immersed in a Geldart B bubbling fluidized bed. International Journal of Computational Methods and Experimental Measurements 6 (1), 2018, 71-85

2017

- *Thiem, S.; Born, A.; Danov, V.;* ***Vandersickel, A****.; Schäfer, J.; Hamacher, T.*: Automated identification of a complex storage model and hardware implementation of a model-predictive controller for a cooling system with ice storage. Applied Thermal Engineering 121, 2017, 922-940

- *Ostermeier, P.;* ***Vandersickel, A****.; Gleis, S.; Spliethoff, H*.: Three dimensional multi fluid modeling of Geldart B bubbling fluidized bed with complex inlet geometries. Powder Technology 312, 2017, 89-102

2016

- *S.Eyerer, C. Wieland,* ***A.Vandersickel,*** *H.Spliethoff,* Experimental Study of an Organic Rankine Cycle (ORC) and Analysis of R1233zd-E as Drop-In Replacement for R245fa for Low Temperature Heat Utilization, *Energy 2016*

- *C. Blomberg, D.Mitakos, M.Bardi, K. Boulouchos, Y.M. Wright,* ***A.Vandersickel***, Extension of the Phenomenological 3-Arrhenius Auto-Ignition Model for six Surrogate Automotive Fuels, SAE Int. J. Engines 9(3) 2016

Before 2016

- ***A.Vandersickel****, A.Mitsos, R.Field,* Integration of a CaO-based Thermal Storage System in an IGCC Plant with Carbon Capture, Conference Proceedings*,* IMECE2014-38113

- ***A.Vandersickel****, R.Field, W.Chen, N.Mancini, A.Mitsos,* CaO-based Energy and CO_2 Storage System for the Flexibilisation of an IGCC Plant with Carbon Capture, Ind. Eng.Chem.Res.2014, 53

- ***A. Vandersickel****, Y.M. Wright, K. Boulouchos,* Global Reaction Model for the Autoignition of Full Boiling Range Gasoline and Kerosene Fuels, Combustion Theory and Modelling, Volume 17, Issue 6, 2013.

- *D. Mitakos, C. Blomberg,* ***A. Vandersickel****, Y. M. Wright, B. Schneider, K. Boulouchos,* Ignition Delays of Different Homogeneous Fuel-Air Mixtures in a Rapid Compression Expansion Machine and Comparison with a 3-stage-Ignition Model Parametrized on Schock Tube Data, SAE Technical paper No. 2013-01-2625, SAE Int.J. Engines 6(4), 2013 – presented at SAE/KSAE 2013 International Powertrains, Fuels & Lubricants Meeting, October 21, 2013, Seoul, South Korea

- ***A. Vandersickel****, M. Hartmann, K. Vogel, Y. M. Wright, M. Fikri, R. Starke, C. Schulz, K. Boulouchos,* The autoignition of practical fuels at HCCI conditions: High-pressure shock-tube experiments and phenomenological modeling, FUEL, vol 93, 2012

- ***A. Vandersickel****, Y.M. Wright, K. Boulouchos, S. Beck, M. Bargende*, Experimental Validation of a Global Reaction Model for a Range of Gasolines and Kerosines under HCCI Conditions, 10th International Conference on Engines & Vehicles, SAE Technical Paper No. 2011-24-0024, September 11th -15th , 2011, Capri, Italy

- ***A. Vandersickel****, Y.M. Wright, K. Boulouchos,* Global Reaction Model for Practical Fuels in HCCI Applications, Thiesel 2010 Conference on Thermo- and Fluid Dynamic Processes in Diesel Engines, September 14th-17th , 2010, Valencia, Spain

- *J. Govaerts,* ***A. Vandersickel****, L. Helsen* Simulation of a thermochemical packed bed reactor developed to treat dried chromate copper arsenate (CCA) impregnated wood waste, High temperature materials and processes Vol. 27, No. 5, 2008.

Invited Talks

- Thermochemische Reaktoren für Hoch-Temperatur Wärmespeicherung in MW-Maßstab: von grundlegenden Experimenten bis zur Anwendung, Talk at the Thermodynamik-Kolloquium 2019 organised by the Fachausschuss „Thermodynamik“ der VDI-Gesellschaft Energie und Umwelt und die ProcessNet-Fachgruppe „Thermodynamik“, 2019

- High Temperature Heat and Water Recovery in a Cheng Cycle, Heat Powered Cycles Conference 2018, Bayreuth

- High temperature thermal energy storage with CaO and MgO in a fluidized bed reactor, Swiss Symposium Thermal energy Storage, 20.January 2017, Luzern, Switzerland

- Energiewende und Energiespeicher - Technische und wirtschaftliche Herausforderungen im Zuge der Energiewende, Vortrag Im Vortragsprogramm der Deutsche Bundesstiftung Umwelt, 14. Januar 2016

Select Conference Publications & Reports

2020

- *Benedikt Schweiger, Anna Hermes, Wolf Wedel, Christoph Matschi, Markus Landerer, Konrad Schönleber,* ***Annelies Vandersickel****, Jens M. Kuckelkorn, Lisa Meyering, Michael Radspieler, Johannes Röder, Isabell Nemeth, Hartmut Spliethoff,* Entwicklung ganzheitlich optimierter, nachhaltiger und übertragbarer Energiekonzepte für komplexe Mischgebiete am Beispiel des TUM Campus Garching - CLEANTECHCAMPUS – SCHLUSSBERICHT des BMWi-Projektes CleanTechCampus (FKZ 03ET1407A und 03ET1407B)

- *Benedikt Schweiger, Anna Hermes, Wolf Wedel, Christoph Matschi, Markus Landerer,* ***Annelies Vandersickel****, Jens M. Kuckelkorn, Isabell Nemeth, Hartmut Spliethoff,* Leitfaden für die Energiesystemoptimierung zur Weiterentwicklung von komplexen Bestandsquartieren, erstellt im Rahmen des BMWi-Projektes CleanTechCampus (FKZ 03ET1407A und 03ET1407B)

2019

- *Ostermeier, P.;* ***Vandersickel, A****.; Spliethoff, H.:* Thermochemische Energiespeicher für Industrie und Kraftwerke. Fachkongress SolarChemieR, 2019

- *Manuel Würth, Moritz Becker, Elija Talebi, Stephan Gleis,* ***Annelies Vandersickel****, Hartmut Spliethoff,* Thermochemical Energy Storage Employing Fluidized Bed Technology: Experimental Investigations with CaO/Ca(OH)2 on a 21kWh Reactor, FLUIDIZATION XVI GUILIN, CHINA, 2019

- *Michael Angerer, Gesa Backofen****, Annelies Vandersickel*** *and Prof. Hartmut Spliethoff,* Power-to-heat with high temperature thermochemical energy storage - A solution for renewable and affordable heat supply for the process industry, IRES 2019

- ***Annelies Vandersickel,*** *Moritz Becker, Stefan Härzschel, Michael Angerer, Peter Ostermeier, Manuel Würth, Dr.-Ing. Stephan Gleis, Prof. Hartmut Spliethoff ,* Thermochemical Energy Storage with $CaO/Ca(OH)_2$ - an attractive option for flexible heat and power generation in industry, Processnet-Jahrestreffen 2019

- ***Vandersickel, A.**, Härzschel S., Becker, M., Spliethoff, H.*, CaO/Ca(OH)2 for thermochemical storage: Kinetics, fluidization and heat transfer behavior. 7th Eur. Conf. Ren. Energy Sys. 10-12 June 2019, Madrid, Spain

2018

- *Ostermeier, P.; Vandersickel, A.; Gleis, S.; Spliethoff, H.:* Einfluss von Partikelgrößenverteilung und Kohäsionseffekten auf das Fluidisierungsverhalten in Gas-Feststoff Wirbelschichten: Analyse mit dem CFD-DEM-Ansatz. 36. CADFEM ANSYS SIMULATION CONFERENCE, 2018

- *Wedel, W. G.; **Vandersickel, A**., Spliethoff, H.:* Comparison of Condensing Technologies for Industrial Applications. ECOS 2018 - Proceedings of the 31st International Conference on Efficiency, Cost, Optimisation, Simulation and Environmental Impact of Energy Systems, 2018

- *Wedel, W. G.; **Vandersickel, A**., Spliethoff, H.:* Evaluation of Natural Gas Technologies for Electricity and Combined Generation. iSEnEC 2018 - Integration of Sustainable Energy EXPO & CONFERENCE, 2018

- ***Vandersickel, A**.; Loeff, J.; Aboueldahabb, A.; Spliethoff, H.:* Small-scale Pumped Heat Electricity Storage for decentralised combined Heat and Power Generation. Heat Powered Cycles Conference 2018, HPC-2018

- ***Vandersickel, A.;** Wedel, W. G.; Spliethoff, H.:* High temperature heat and water recovery in steam injected gas turbines using an open absorption heat pump. Heat Powered Cycles Conference 2018, 2018HPC-2018

- *Becker, M.; Würth, M.; Angerer, M.; Härzschel, S.; Gleis, S.; **Vandersickel, A.**;* Spliethoff, H.: Thermochemical Energy Storage with CaO/Ca(OH)2 – Development of a Continuous Fluidized Bed Reactor. 12th International Conference on the Storage of Renewable Energies , 2018 IRES 2018

- *Ostermeier, P.; **Vandersickel, A**.; Gleis, S.; Spliethoff, H.:* Numerical approaches for modeling gas-solid fluidized bed reactors: comparison of models and application to different technical problems. 2018 CLEARWATER CLEAN ENERGY CONFERENCE, 2018

- *Eisner, J**.; Vandersickel, A.;** Baur, S*.: Simple Measurement Technique of the Electricity Demand in Developing Countries. ICDRET 2018, 2018The 5th International Conference on Developments in Renewable Energy Technology

- *Contributor to the Public Report of the IEA ECES Annex 30 – TES for energy management and CO_{2}-* Mitigation*:* APPLICATIONS OF THERMAL ENERGY STORAGE IN THE ENERGY TRANSITION - BENCHMARKS AND DEVELOPMENTS", [Gibb et al., German Aerospace Center (DLR)], IEA Technology Collaboration Programme on Energy Conservation through Energy Storage (IEA-ECES), 2018.

2017

- *Ostermeier, P.; **Vandersickel, A**.; Gleis, S.; Spliethoff, H.:* Wärmeübergang in Gas-Feststoff Wirbelschichten: Simulation, Validierung, Anwendung. 35. CADFEM ANSYS SIMULATION CONFERENCE, 2017

- *Ostermeier, P.; **Vandersickel, A.;** Becker, M.; Gleis, S.; Spliethoff, H.:* Hydrodynamics and heat transfer around a horizontal tube immersed in a Geldart B bubbling fluidized bed. 9th INTERNATIONAL

CONFERENCE ON COMPUTATIONAL & EXPERIMENTAL METHODS IN MULTIPHASE & COMPLEX FLOW, 2017

- *Angerer, M.;* ***Vandersickel, A****.; Özdin, D.; Spliethoff, H.:* Flexibilization of Industrial Combined Heat and Power Plants using Thermochemical Energy Storage. IRES 2017, 2017

- *Ostermeier, P.;* ***Vandersickel, A.;*** *Becker, M.; Gleis, S.; Spliethoff, H.:* Numerical-correlative prediction of heat transfer in Geldart B bubbling fluidized beds. 10th World Congress of Chemical Engineering, 2017

- *Würth, M.; Becker, M.; Sonnen, R.;* ***Vandersickel, A.;*** *Gleis, S.; Spliethoff, H.:* Cohesive powders in thermochemical energy storage applications: Fluidization and heat transfer behavior. 10th World Congress of Chemical Engineering, 2017

2016

- *Peter Ostermeier,* ***Annelies Vandersickel****, Stephan Gleis, Hartmut Spliethoff:* Numerische Simulation der Hydrodynamik in einer blasenbildenden Gas-Feststoff Wirbelschicht. 34. CADFEM ANSYS SIMULATION CONFERENCE, 2016

- *Peter Ostermeier,* ***Annelies Vandersickel****, Stephan Gleis, Hartmut Spliethoff:* Numerical simulation of gas-solid fixed bed reactors: approaches, sensitivity and verification, 14th Multiphase flow conference, 2016

- ***Vandersickel A****., Aboueldehab A., Spliethoff H.:* Small-scale Pumped Heat Electricity Storage for decentralized combined Heat and Power Generation, proceedings of ECOS 2016, June 19-23, 2016, Portoroz, Slovenia

- *B. Hetterich, J. Dorfner,* ***A.Vandersickel****, H.Spliethoff* Optimal energy supply system and hourly operation plan for the TUM campus Garching using linear programming model URBS, proceedings of ECOS 2016, June 19-23, 2016, Portoroz, Slovenia

- *J.E. Concalves,* ***A. Vandersickel*****,** Review of High-Temperature solid particle receiver/reactor concepts, 16th Brazilian Congress of Thermal Sciences and Engineering (ENCIT 2016), November 07-10th, 2016, Vitória, ES, Brazil

Before 2015

- ***Vandersickel A.,*** *Aboueldehab A., Spliethoff A.,* Electro-thermal Electricity Storage for decentralized power and heat generation, AIChE 2015, *November 8-13, Salt Lake City, USA*

- ***Vandersickel A.****, von Gamm M., Angerer M, Spliethoff H.,* Highly Load-flexible coal fired power plants though the integration of molten salt storage, *IRES 2015, march 9-11, Düsseldorf, Germany*

- ***Vandersickel A****., Mitsos A.,* Increasing the Operating Range of an IGCC Plant with Carbon Capture through the Integration of a CaO-Based Thermal Storage System, *presented at AICHE Annual Meeting 2014,November 16-21, Atlanta, USA*

- ***Vandersickel A.,*** *R. Field, W.Chen and N.Mancini, Mitsos A.,*Integration of a CaO-based energy and CO2 storage system in an IGCC plant with carbon capture, *ECOS2013, July 16-19, 2013, Guilin, China*

- ***Vandersickel A.,*** *Y.M. Wright and K. Boulouchos* Global Combustion Model for practical fuels in HCCI combustion, International Energy Agency, 33rd Task leader Meeting, Lund, Sweden

- ***Vandersickel A***.*, Y.M. Wright and K. Boulouchos* Global Reaction Model for Technical Fuels in HCCI Applications, European Combustion Meeting June 28th – July 1st, 2011, Cardiff, UK

- ***Vandersickel A,*** *M. Hartmann, D. Mitakos, S. Beck and V. Rajamani* Beschreibung des Zündverzuges und der Brennrate von homogenen selbstzündenden Brennverfahren (HCCI) in Abhängigkeit des Ladungszustandes und der Kraftstoffeigenschaften, FVV Informationstagung Motoren, volume R553, Frühjahr 2011, Bad Neuenahr, Germany

- ***Vandersickel A.,*** *Y.M. Wright and K. Boulouchos,* Universal Autoignition Models for 'designer' fuels in HCCI Combustion, International Energy Agency, 32st Task leader Meeting, Nara, Japan

- ***Vandersickel A,*** *M. Hartmann, D. Mitakos, S. Beck and V. Rajamani,* Beschreibung des Zündverzuges und der Brennrate von homogenen selbstzündenden Brennverfahren (HCCI) in Abhängigkeit des Ladungszustandes und der Kraftstoffeigenschaften, FVV Informationstagung Motoren, volume R547, Herbst 2009, Dresden, Germany

- ***Vandersickel A.,*** *Y.M. Wright and K. Boulouchos* , Towards a 'lumped' reaction model for future 'designer' fuels, International Energy Agency, 31st Task leader Meeting, Lake Louise, Canada

- ***Vandersickel A.,*** *A.M. Schmid, Y.M. Wright, C. Lämmle, K. Boulouchos,* Experimental and numerical investigations of a none swirling hollow cone injector, Ilass September 8th -10th , 2008, Como Lake, Italy