Curriculum Vitae and List of Publications

BE2020_2.0

Haslinger, Walter; Dipl.-Ing. Dr. Adj. Prof.

BEST – Bioenergy and Sustainable Technologies GmbH (former BIOENERGY 2020+ GmbH)

Head Office Graz, Inffeldgasse 21b, 8010 Graz, Austria

Education and Employment

From (year)	to (year)	
Employment		
10/2014		CEO/CSO, BEST – Bioenergy and Sustainable Technologies GmbH (former BIOENERGY 2020+ GmbH), Inffeldgasse 21b, 8010 Graz, Austria
08/2003	09/2014	Area Manager, BIOENERGY 2020+ GmbH (former Austrian Bioenergy Centre GmbH), Location Wieselburg-Land, Gewerbepark Haag 3, 3250 Wieselburg-Land, Austria
10/2000	08/2003	Head of sector NonFood, University of Applied Sciences Wiener Neustadt, Zeiselgraben 4, 3250 Wieselburg-Land, Austria
11/1999	09/2000	Auxiliary Agent, Institute for Systems Informatics and Safety, Joint Research Centre of the European Commission, Via Enrico Fermi 2749, 21027 Ispra (VA), Italy
10/1997	09/1999	Junior Researcher, Institute for Chemical Engineering, Vienna University of Technology, Getreidemarkt 9, 1060 Vienna, Austria
Educational Degrees		
	2007	Dr. techn. from Vienna University of Technology, with distinction Title of thesis: The Potential of Scale Models for Scale-Up and Fluid Dynamic Optimization of Fluidized Bed Systems.
	1997	Graduate Degree from Vienna University of Technology, with distinction Title of thesis: Charakterisierung und Optimierung einer intem zirkulierenden Wirbelschicht für katalytisches Cracken (Characterization and Optimization of an Internally Circulating Fluidized Bed for Catalytic Cracking)
	1991	Undergraduate Degree from Vienna University of Technology

Research *(main areas)*

- ✓ **Biomass resources and technical logistics**
  - Resource availability and sustainable supply chains
  - Pellets production from other than softwood sources, in particular from agricultural biomass, most recent activities pellets production of torrefied biomass
  - Identification of production characteristics, comparative assessment of energy consumption and specific mass flow, optimization measures at industrial plants, influence of additives on production characteristics
- ✓ **Biomass fuel characterization**
  - Combustion and safety relevant characterization of solid biomass fuels, including standard and innovative experimental, analytical, and statistical procedures and methods
  - Key aspects are pre-normative research to support standard development for the creation of relevant market conditions and determination of fuel characteristics for developing and optimizing combustion technology
- ✓ **Biomass combustion technology (main focus of my own research activities)**
  - Development of combustion systems with maximum efficiency and minimum emissions (special focus stoves)

- Consequent implementation of existing know-how for technology development
- Development and assessment of new combustion concepts for all kinds of solid biomass fuels for small scale (serial or close to serial production) appliances
- Development and integration of secondary measures (combustion catalysts)
- Development of combustion and load control concepts aiming at best possible opportunities for system integration
- Development of improved assessment procedures (annual efficiency vs. testing efficiency, emission factors vs. emissions under steady state testing conditions)
- Pre-normative research on advanced testing procedures (test cycle for annual efficiency and emission factors for boilers, advanced testing procedures for stoves)

✓ **Technical energy systems**
- Biomass based hybrid systems
- Biomass based micro-CHP systems
- Smart heating and cooling grids

Projects

✓ **International projects (selection)**
- AshMelT – Development of a practical and reliable ash melting test for biomass fuels, in particular for wood pellets (FP7)
- SafePellets – Safety and quality assurance measures along the pellets supply chain (FP7)
- SECTOR – Production of Solid Sustainable Energy Carriers from Biomass by Means of Torrefaction (FP7)
- BeReal – Advanced Testing Methods for Better Real Life Performance of Biomass Heating Appliances (FP7)
- BioMaxEff – Cost efficient biomass boiler systems with maximum annual efficiency and lowest emissions (FP7)
- BioCAT – Clean Air Technology for Small-Scale Biomass Combustion Systems (FP7)

✓ **National projects (selection)**
- TorrChance - Analyse und Bewertung der Chancen torrefizierter Biomasse auf dem österreichischen Energiemarkt (TorrChance – Analysis and assessment of the opportunities of torrefied biomass on the Austrian energy market) (funded in the program: Intelligent Production)
- Neue Öfen 2020 – Der Ofen der Zukunft für das Haus der Zukunft – Maßnahmen zur Umsetzung des höchstmöglichen Standes der Technik von Öfen für stückige Holzbrennstoffe / New Stoves 2020 – The stove of the future for the building of the future – measures for the implementation of the highest possible state of technology of firewood stoves (funded in the frame of Neue Energien 2020 / New Energies 2020)
- Ofenprüfung 2020 – Entwicklung eines heiztechnischen Prüfverfahrens für Scheitholzöfen mit hoher Praxisrelevanz / Stove testing procedure 2020 – Development of testing procedure for firewood stoves with high practical relevance (funded in the frame of Neue Energien 2020 / New Energies 2020)
- ActiveCond – Aktive Abgaskondensation mit Wärmepumpen zur Effizienzsteigerung bei seriennahen Biomassefeuerungen / ActiveCond – Active Flue Gas Condensation at Close to Series Biomass Heating Systems (funded in the frame of Neue Energien 2020 / New Energies 2020)
- StirBio – Entwicklung einer Versuchsfeuerung mit optimiertem Wärmetauscher zur Integration eines Stirling-Moduls / StirBio – Development of a test furnace with optimized heat exchanger for the integration of a Stirling module (funded in e!Missi0n+.at – Energy Mission Austria)

✓ **COMET projects (selection)**
- FLOWs II – Future Log Wood Stoves II (funded in the **COMET** program)
- BIOTHEG I-III – project series for concept development and integration of thermoelectrics into biomass boilers and stoves (funded in the frame of the **K***plus* and **COMET** programs)

Honours and Awards

✓ **Adjunct Professor** for Energy Technology at the Energy Division, Luleå University of Technology (Sweden) since 06/2017

- ✓ **Member of scientific and of program committees of international conferences**
  - Board member of the European Technology (and Innovation) Platform – Renewable Heating and Cooling
  - Member of the Scientific Committee of the Global Conference on Global Warming 2015
  - Since 2015 Member of the Scientific Committee of the WSED Young Researchers Conference
  - Since 2011 Member of the Scientific Committee of the European Biomass Conference and Exhibition
  - 2011-2014 Member of the Scientific Committee of the WSED Next Conference
  - 2009-2014 Member of the Program Committee of the Industry Forum Pellets
- ✓ **Chairmanships at**
  - WSED Young Researchers – Biomass 2015, 2016, 2017, 2018, 2019
  - EUBCE 2010, 2011, 2015
  - WSED Next – Biomass 2012, 2013, 2014
- ✓ **Session organisation**
  - Bioenergy 2020+ Day in the frame of the CEBC 2017
  - Austrian Day in the frame of the EUBCE 2015
- ✓ **International Research Award**
  - Poster award: Wopienka E, Carvalho L, Öhman M, Schwabl M, **Haslinger W.** 2011. Evaluation of the ash melting behaviour of solid biomass based on fuel analyses. 19th European Biomass Conference, 6th to 10th of June 2011, Berlin, Germany.
- ✓ **Editorial / advisory board of international journals**
  - Since 2010: Associate Editor of Elsevier Ltd journal Biomass and Bioenergy, in 2016 temporarily substituting one of the editors-in-chief
- ✓ **Peer-review assignments for journals**
  - Since 2016: Reviewer for Renewable Energy, 0-1 reviews / year
  - Since 2011: Reviewer for Renewable & Sustainable Energy Reviews, 1-2 reviews / year
  - Since 2011: Reviewer for Fuels, 1-2 reviews / year
  - Since 2010: Reviewer for Biomass and Bioenergy, 1-2 reviews / year
  - Since 2009: Reviewer of Annals of Occupational Hygiene, 0-1 reviews / year
  - Since 2009: Reviewer of Sustainability, 0-1 review / year
- ✓ **Evaluator assignments**
  - Expert evaluator in H2020-WIDESPREAD-03-2018 - Twinning
  - Expert evaluator in H2020-MSCA-ITN-2017 – “Innovative Training Networks”

Publications *(last five years); Please highlight publications relevant to COMET Centre – <u>all publications relevant to COMET Centre</u>*

- ✓ **Peer-reviewed publications in International Journals**

Rebbling A, Näzelius IL, Schwabl M, Feldmeier S, Schön C, Dahl J, **Haslinger W**, et al. Prediction of slag related problems during fixed bed combustion of biomass by application of a multivariate statistical approach on fuel properties and burner technology. Biomass Bioenergy 2020;137:105557.

Sedlmayer I, Bauer-Emhofer W, **Haslinger W**, Hofbauer H, Schmidl C, et al. Off-gassing reduction of stored wood pellets by adding acetylsalicylic acid. Fuel Process Technol 2020;198: 106218.

Sedlmayer I, Arshadi M, **Haslinger W**, Hofbauer H, Larsson I, Lönnermark A, et al. Determination of off-gassing and self-heating potential of wood pellets – Method comparison and correlation analysis. Fuel 2018;234:894-903.

Klauser F, Schmidl C, Reichert G, Carlon E, Kistler M, Schwabl M, **Haslinger W**, Kasper-Giebl A. Effect of Oxidizing Honeycomb Catalysts Integrated in a Firewood Room Heater on Gaseous and Particulate Emissions, Including Polycyclic Aromatic Hydrocarbons (PAHs). Energy Fuels 2018;32(11):11876-11886.

Klauser F, Carlon E, Kistler M, Schmidl C, Schwabl M, Sturmlechner R, **Haslinger W**, Kasper-Giebl A. Emission characterization of modern wood stoves under real-life oriented operating conditions. Atmos Environ 2018;192:257-266.

Reichert G, Schmidl C, **Haslinger W**, Stressler H, Sturmlechner R, Schwabl M, et al. Impact of oxidizing honeycomb catalysts integrated in firewood stoves on emissions under real-life operating conditions. Fuel Process Technol 2018;177:109-118.

Klauser F, Schwabl M, Kistler M, Sedlmayer I, Kienzl N, Weissinger A, Schmidl C, **Haslinger W**, Kasper-Giebl A. Development of a compact technique to measure benzo(a)pyrene emissions from residential wood combustion, and subsequent testing in six modern wood boilers. Biomass Bioenergy 2018;111:288-300.

Reichert G, Schmidl C, **Haslinger W**, Stressler H, Sturmlechner R, Schwabl M, et al. Catalytic efficiency of oxidizing honeycomb catalysts integrated in firewood stoves evaluated by a novel measuring methodology under real-life operating conditions. Renew Energy 2018;117:300-313.

Reichert G, Schmidl C, **Haslinger W**, Stressler H, Sturmlechner R, Schwabl M, et al. Novel Method Evaluating Real-Life Performance of Firewood Roomheaters in Europe. Energy Fuels 2018;32(2):1874-1883.

Reichert G, Schmidl C, **Haslinger W**, Stressler H, Sturmlechner R, Schwabl M et al. Long term durability and safety aspects of oxidizing honeycomb catalysts integrated in firewood stoves. Biomass Bioenergy 2017;105:428-42.

Reichert G, Hartmann H, **Haslinger W**, Öhler H, Mack R, Schmidl C, et al. Effect of draught conditions and ignition technique on combustion performance of firewood roomheaters. Renew Energy 2017;105:547-60.

Gehrig M, Jaeger D, Pelz SK, Kirchhof R, Thorwarth H, **Haslinger W**. Influence of a direct firebed cooling in a residential wood pellet boiler with an ash-rich fuel on the combustion process and emissions. Energy Fuels 2016;30(11):9900-07.

Reichert G, Schmidl C, **Haslinger W**, Schwabl M, Moser W, Aigenbauer S, et al. Investigation of user behavior and assessment of typical operation mode for different types of firewood room heating appliances in Austria. Renew Energy 2016;93:245-54.

Gehrig M, Jaeger D, Pelz SK, Weissinger A, Groll A, Thorwarth H, **Haslinger W**. Influence of a Direct Firebed Cooling in a Residential Wood Pellet Boiler with an Ash-Rich Fuel on the Combustion Process and Emissions. Atmos Environ 2016;136:61-67.

Carlon E, Schwarz M, Prada A, Golicza L, Verma VK, Baratieri M, Gasparella A, **Haslinger W**, Schmidl C. On-site monitoring and dynamic simulation of a low energy house heated by a pellet boiler. Energy Build 2016;116:296-306.

Meier F, Sedlmayer I, Emhofer W, Wopienka E, Schmidl C, **Haslinger W**, et al. Influence of Oxygen Availability on off-Gassing Rates of Emissions from Stored Wood Pellets. Energy Fuels 2016;30(2):1006-12.

Gehrig M, Pelz S, Jaeger D, Hofmeister G, Groll A, Thorwarth H, **Haslinger W**. Implementation of a firebed cooling device and its influence on emissions and combustion parameters at a residential wood pellet boiler. Appl Energy 2015;159:310-16.

Carlon E, Schwarz M, Golicza L, Verma VK, Prada A, Baratieri M, **Haslinger W**, et al. Efficiency and operational behaviour of small-scale pellet boilers installed in residential buildings. Appl Energy 2015;155:854-65.

Carlon E, Verma VK, Schwarz M, Golicza L, Prada A, Baratieri M, **Haslinger W**, Schmidl C. Experimental validation of a thermodynamic boiler model under steady state and dynamic conditions. Appl Energy 2015;138:505-16.

Emhofer W, Lichtenegger K, **Haslinger W**, Hofbauer H, Schmutzer-Roseneder I, Aigenbauer S, et al. Ventilation of Carbon Monoxide from a Biomass Pellet Storage Tank - A Study of the Effects of

Variation of Temperature and Cross-Ventilation on the Efficiency of Natural Ventilation. Ann Occup Hyg 2015;59(1):79-90.

Hebenstreit B, Schnetzinger R, Ohnmacht R, Höftberger E, Lundgren J, **Haslinger W**, et al. Technoeconomic study of a heat pump enhanced flue gas heat recovery for biomass boilers. Biomass Bioenergy 2014;71:12-22.

Grammelis P, Goodwin N, Alakangas E, **Haslinger W**, Karampinis E. The biomass technology roadmap of the RHC-Platform: priorities for high-efficient large-scale CHP units. VGP PowerTech 2014;6:74-79.

Schwabl M, Schwarz M, Figl F, Carvalho L, Staudinger M, Kalb W, Schmidl C, **Haslinger W**. Development of a biomass heating device for low energy and passive houses. Manage Environ Qual 2013;24(5):652-66.

Carvalho L, Wopienka E, Pointner C, Lundgren J, Verma VK, **Haslinger W**, et al. Performance of a pellet boiler fired with agricultural fuels. Appl Energy 2013;104:286-96.

- ✓ **Peer-reviewed Conference Papers (full paper review)**

Sturmlechner R, Schmidl C, Carlon E, Reichert G, Stressler H, Klauser F, Kelz J, Schwabl M, Kirchsteiger B, Kasper-Giebl A, Höftberger E, **Haslinger W**. Real-life emission factor assessment for biomass heating appliances at a field measurement campaign in Styria, Austria. Air pollution 2019. 26th to 28th of June 2019, Aveiro, Portugal. (Published as Sturmlechner R, Schmidl C, Carlon E, Reichert G, Stressler H, Klauser F, Kelz J, Schwabl M, Kirchsteiger B, Kasper-Giebl A, Höftberger E, **Haslinger W**. Real-life emission factor assessment for biomass heating appliances at a field measurement campaign in Styria, Austria. WIT Trans Ecol Environ 2019;236:221-231.)

Sturmlechner R, Stressler H, Schwabl M, Reichert G, Carlon E, **Haslinger W**, et al. Emission factor assessment for two firewood stoves. Air Pollution 2017. 25th to 27th of April 2017, Cadiz, Spain. (Published as: Sturmlechner R, Stressler H, Schwabl M, Reichert G, Carlon E, **Haslinger W**, et al. Emission factor assessment for two firewood stoves. WIT Trans Ecol Environ 2017;211:171-182.)

Carlon E, Schwarz M, Schmidl C, Baratieri M, Gasparella A, **Haslinger W**. Low Energy Houses Heated by Biomass Boilers: Optimization of the Heating System Control Strategy by Means of Dynamic Simulation. 3rd International High Performance Buildings Conference at Purdue, 14th to 17th of July 2014, West Lafayette, IN, USA.

- ✓ **Conference presentations (plenary / oral plus proceedings)**

Kelz J, Krenn O, Zemann C, Muschick D, Hofmeister G, Gölles M, Retschitzegger S, Weissinger A, Schmidl C, **Haslinger W**, Hochenauer C. 2017. Evaluation of the combustion behaviour of straw, poplar and maize in a small-scale biomass boiler. 25th European Biomass Conference and Exhibition, 12th to 15th of June 2017, Stockholm, Sweden.

Klauser F, Sturmlechner R, Schwabl M, Reichert G, Schmidl C, Weissinger A, **Haslinger W**, Stressler H. 2017. CleanAir by Biomass - Status Quo Analysis of the Model Region. 25th European Biomass Conference and Exhibition, 12th to 15th of June 2017, Stockholm, Sweden.

Meier F, Schwabl M, Sedlmayer I, Kistler M, Schmidl C, **Haslinger W.** 2016. Benzo(a)pyrene emission in the flue gas from modern biomass boilers. 24th European Biomass Conference and Exhibition, 6th to 9th of June 2016, Amsterdam, Netherlands.

Reichert G, Stressler H, Schmidl C, Schwabl M, Sturmlechner R, **Haslinger W.** 2016. Emission Reduction of Firewood Roomheaters by Optimization of Operating Conditions and Catalyst Integration. 24th European Biomass Conference and Exhibition, 6th to 9th of June 2016, Amsterdam, Netherlands.

Reichert G, Schmidl C, Schwabl M, Stressler H, Sturmlechner R, **Haslinger W.** 2015. Integration of Oxidative Honeycomb Catalysts in Firewood Stoves - Performance Analysis, Safety Aspects and Long Term Durability. 23rd European Biomass Conference and Exhibition, 1st to 4th of June 2015, Vienna, Austria.

Reichert G, Schmidl C, **Haslinger W,** Moser W, Aigenbauer S, Figl F, et al. 2014 Residential Wood Combustion (RWC) -Investigation of user behavior and operating conditions regarding stoves and their impact on emissions and efficiency. Central European Biomass Conference 2014, 15th to 18th of January 2014, Graz, Austria.

Reichert G, Wöhler M, Schwabl M, Schmidl C, Aigenbauer S, Bachmaier H, Figl F, Hartmann H, **Haslinger W,** et al. 2014. BioCAT – Clean air technology for small-scale combustion systems. Central European Biomass Conference 2014, 15th to 18th of January 2014, Graz, Austria.

Emhofer W, Pöllinger-Zierler B, Siegmund B, **Haslinger W,** Leitner E. 2013. Correlation between CO off-gassing and linoleic fatty acid content of wood chips and pellets. 21st European Biomass Conference, 3rd to 7th of June 2013, Copenhagen, Denmark.

- ✓ **Conference presentations (Visual / Poster Presentations + Conference Proceedings)**

Aigenbauer S, Riepl R, Mair C, Höftberger E, Schmidl C, Weissinger A, **Haslinger W**. 2017 Experimental evaluationof a biomass pellet combustion concept developed for a 5 kW_{el} Stirling module. CEBC 2017, 18th to 20th of Jan 2017, Graz, Austria.

Emhofer W, Sedlmayer I, Wopienka E, Pointner C, Weissinger A, Schmidl C, **Haslinger W**, et al. 2017. Production related optimization of wood pellets storage properties. CEBC 2017, 18th to 20th of Jan 2017, Graz, Austria.

- ✓ **Conferences / Seminars (Presentations only)**

Klauser F, Schwabl M, Sedlmayer I, Kistler M, Schmidl C, Weissinger A, **Haslinger W**, Kasper Giebl A. 2017. A compact BaP emission measurement method for residential wood combustion and preliminary results from modern biomass boiler testing. CEBC 2017, 18th to 20th of Jan 2017, Graz, Austria.

Walch J, Buchner M, **Haslinger W**, Hofstetter C, Kohl P, Mandic M, et al. 2017. Why we heat, how we heat?. CEBC 2017, 18th to 20th of Jan 2017, Graz, Austria.

- ✓ **Invited lectures and key notes**

Haslinger W. 20 years of RD&D experience with the dual fluidized bed steam gasification concept. µCHP 2016 – micro cogeneration through biomass gasification, 2nd to 3rd of December 2016, Bolzano, Italy. (presentation only)