University Academic Curriculum Vitae

Personal information

Name: Stefano Piazzi
Place of birth: Trento (Italy)
Nationality: Italian
Telephone numbers:
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Education since leaving school

- 2011/2014, Bachelor's Degree in Environmental and Land Engineering (University of Trento)
- 2014/2017, Master's Degree in Energy Engineering (University of Trento/Free University of Bozen-Bolzano)
- 2017/2020, Ph.D. in Sustainable Energy and Technologies (Free University of Bozen-Bolzano)

Present appointment

- Research assistant, disciplinary sector ING-IND/10 (Thermal engineering and industrial energy systems)
- Start of appointment: 01.02.2023
- Employer: Free University of Bozen-Bolzano, Faculty of Science and Technology
- Area of Research: the research work focuses on biomass gasification and the subsequent conversion of producer gas to biofuels and hydrogen.
- Activities: the teaching and research activities are relevant to the ING-IND/10 sector. The main research work deals with the conversion of solid fuels (biomass and wastes) to producer gas through the gasification process and its subsequent conversion to liquid and gaseous biofuels, i.e. Fischer-Tropsch fuels, biomethane and hydrogen. Experimental analysis as well as techno-economic modeling are carried out for the characterization of the overall plant performances and for the sustainable valorization of the feedstocks. The main activities are: 1) biomass, char and other solid characterization, i.e. physical-chemical and energetic characteristics; 2) design and testing of lab-scale setup both for the gasification process and the producer gas upgrade to hydrogen; 3) design and testing of lab-scale producer gas cleaning, including a PSA system for pure hydrogen production 4) characterization of the products and the by-products of all the processes, i.e. producer gas, char and tar.
  The research activity also focused on the 1) design and setup of a new gasification pilot-plant that aims at the production of electricity with a Stirling engine, heat and clean biochar that can be used in agriculture as soil improver, using residual biomass (both dry and wet); 2) support in the analysis of the emission of an internal combustion engine, run with diesel fuel and producer gas; 3) support in the analysis of pollutants emissions from a newly designed biomass stove; 4) analysis of the tar cracking behavior of a catalytic char-bed; 5) on-site monitoring of different biomass-to-X full- and pilot-scale plants (gasification and hydrothermal plants); 6) support in the experimental activity of a lab-scale biochemical reactor that aims at the production of biomethane through syngas fermentation.

Professional experience

Chronological list of all previous employments

From / to	Job title	Name of company	Responsibilities
2021/-	Research assistant	Free University of Bozen-Bolzano	- Experimental activities as well as techno-economic modeling on different biomass-to-X systems. - Preparation of research project proposal.

Experience in academic teaching

Lectures

2023 - 2024

Free University of Bozen-Bolzano, Faculty of Science and Technology

- Teaching Assistant for the course “Power Production, CHP and District Heating Systems”, within the Master in Energy Engineering
- Teaching Assistant for the course “Thermo-mechanicals measurements”, within the Master in Industrial Mechanical Engineering

2022 - 2023

Free University of Bozen-Bolzano, Faculty of Science and Technology

- Teaching Assistant for the course “Power Production, CHP and District Heating Systems”, within the Master in Energy Engineering

2021 - 2022

Free University of Bozen-Bolzano, Faculty of Science and Technology

- Teaching Assistant for the course “Power Production, CHP and District Heating Systems”, within the Master in Energy Engineering

2019 – 2020

Free University of Bozen-Bolzano, Faculty of Science and Technology

- Teaching Support for the course “Power Production, CHP and District Heating Systems”, within the Master in Energy Engineering

Thesis supervision, co-supervision and tutoring

2022/2023

- Co-supervisor of the Master Thesis: “Modelling of an integrated and flexible biomass gasification and renewable power-to-gas process for advanced biofuels production”, candidate: Jenny Ress, Master in Energy Engineering
- Co-supervisor of the Master Thesis: “Renewable hydrogen production from biomass using gasification activated carbon”, candidate: Anton Schuh, Master in Energy Engineering
- Co-supervisor of the Master Thesis: “Application of a small-scale PSA system for sustainable hydrogen production via biomass gasification”, candidate: Mattia Soravia, Master in Energy Engineering

2021/2022

- Co-supervisor of the Master Thesis: “Techno-economic analysis of biomass-based hydrogen production systems”, candidate: Claudio Bertamini, Master in Energy Engineering

2019/2020

- Co-supervisor of the Master Thesis: “Investigation on the hydrogen production potential of a small-scale solar-driven gasifier”, candidate: Damiano Valentini, Master in Energy Engineering

2016/2017

- Co-supervisor of the Master Thesis: “Gassificazione di biomassa: analisi prestazionale e ottimizzazione di impianti commerciali in condizioni di esercizio”, candidate: Alessio Valentini, Master in Environmental and Land Engineering

Research and scholarships

Summary of current research and scholarship:

- 2023 – Today
  Research assistant
  Free University of Bolzano, Faculty of Science and Technology
  Title of the project: “Biomass and biofuels: thermochemical conversion processes, energy efficiency, and sustainable use of the resource
  Activities related to the project: The activity is aimed at evaluating energy and process aspects related to: - energy production from biomass, with a special focus on thermochemical conversion processes (pyrolysis, gasification, carbonization, liquefaction, combustion) and their coupling with biochemical processes for the production of biofuels; - sustainable use of the resource, with a special focus on the valorization of waste biomass or waste. The research methods, both experimental and theoretical, are applied to the processes investigated at both laboratory and pilot scales.
  Supervisor of the research: Prof. Marco Baratieri

Summary of research and scholarship during the previous five years:

- 2022 – 2023
  Research assistant
  Free University of Bolzano, Faculty of Science and Technology
  Title of the project 1: “Biochar polymer composites with specific properties for innovative applications in material technology (BioPolyComp)”
  Activities related to project 1: Characterization of different char (both from gasification and pyrolysis) for the production of thermoplastic polymers
  Title of the project 2: AgroAlimentary and agroForestry by-products: Thermochemical Evolution pRocess (AFTER)
  Activities related to project 2: Design support and setup of a new gasification pilot plant
  Supervisor of the research: Prof. Marco Baratieri

- 2021 – 2022
  Research assistant
  Free University of Bolzano, Faculty of Science and Technology
  Title of the project: “AgroAlimentary and agroForestry by-products: Thermochemical Evolution pRocess (AFTER)”
  Activities: Design support and setup of a new gasification pilot plant
  Supervisor of the research: Prof. Marco Baratieri

- 2017 – 2020

PhD in Sustainable Energy and Technologies – XXXIII Cycle
Free University of Bolzano, Faculty of Science and Technology
Title: "Biomass to Fischer-Tropsch fuels and hydrogen: an integrated analysis for designing gasification-based systems"
Supervisor: Prof. Marco Baratieri

- 03/2017 – 09/2017
  Research Support Activity
  Free University of Bolzano, Faculty of Science and Technology
  Title of the project: "Aspen Plus® modelling of co-combustion scenarios of biomass and gasification char"
  Supervisor of the research: Prof. Marco Baratieri

International research experiences:

- Period: 09/2016 – 12/2016
  Location: Queen's University of Belfast
  Title of the project: "Char combustion and co-combustion"
  Supervisor: Prof. Xiaolei Zhang

List of research grants and contracts as participant

Period	**Funding Body**	**Title**
2024	Third party contract (AGSM AIM Energia S.p.A.)	Sewage Sludge Combustion (SSC) for PFAS (PFC) destruction, PI: Marco Baratieri
09/2023 – 09/2025	Italian Ministry for Education and Scientific Research, MUR (PRIN 2022)	Decarbonized and CirculAR hydrogeN prOducTion through biomass and waste gasification (CARNOT), PI: Marco Baratieri
09/2023 – 08/2025	European Regional Development Fund of the European Union and Autonomous Province of Bozen-Bolzano (ERDF 2021-2027)	Recupero di nutrienti dal processo HTC (RFD), PI: Francesco Patuzzi
10/2022 – 03/2023	Third party contract (KWB Energiesysteme GmbH)	Test of biomass boilers fed with agricultural residues (BOIL-RES), PI: Marco Baratieri
06/2023 – 11/2023	Third party contract (Palazzetti Lelio S.p.A.)	GAsification for improved combustion in a biomass STOVE – Part 2 (GASTOVE_2), PI: Marco Baratieri
09/2022 – 02/2024	European Commission, Interreg Alpine Space Programme	Alps4GreenC - Implementation pathways for sustainable Green Carbon production in the Alpine Region
2021-2025	Funded by the European Union in the framework of the Horizon 2020 Research and Innovation	A FRONTrunner approacTransition to a circular & resilient future: deployment of systemic solutions with the support of local clusters and the development of regional community-based innovation

	Programme under grant agreement No. 101037031	schemes (FRONTSH1P)
2022	Third party contract (Yanmar)	On-site monitoring of Yanmar gasifier and validation of an in-house method for tar sampling and quantification (ONMYA), PI: Marco Baratieri
2022	Austrian Research Promotion Agency, FFG (Produktion der Zukunft – 32. Ausschreibung)	Biochar polymer composites with specific properties for innovative applications in material technology (BioPolyComp) , PI: Marco Baratieri
2022	Third party contract (HBI s.r.l.)	On-site monitoring of HBI integrated hydrothermal carbonization and gasification plant in Fusina (VE) (HBI_2), PI: Francesco Patuzzi
2021	Third party contract (HBI s.r.l.)	On-site monitoring of HBI integrated hydrothermal carbonization and gasification plant (HBI), PI: Francesco Patuzzi
2021	Energy Agency South Tyrol – CasaClima	Green Hydrogen for the Alps, PI: Marco Baratieri
2019-2022	Italian Ministry of Education, University and Research (PRIN 2017)	BIOmasses Circular Holistic Economy APproach to EneRgy equipments (BIO-CHEAPER), PI: Marco Baratieri
2020-2022	FUB internal funding (RTD call 2020)	SMall-scale producer gas Upgrading for Biofuels (SMUP), PI: Francesco Patuzzi
2020-2021	Third party contract (Sauber)	AgroForesty by-products: ThERmochemical evolution process (AFTER), PI: Marco Baratieri
10/2019 – 09/2020	Third party contract (Palazzetti Lelio S.p.A.)	GAsification for improved combustion in a biomass STOVE (GASTOVE), PI: Marco Baratieri
2018-2020	FUB internal funding (RTD call 2018)	CHAR re-Circulation for improving the Conversion yields in fixed-bed biomass gasification systems (CHAR-RCC), PI: Francesco Patuzzi
2018	Third party contract (Yanmar)	KINetics analysis of char bed Gasification (KING), PI: Marco Baratieri
2018	Third party contract (Yanmar)	Pre-design assessments of different reactor concepts (PRE-DES), PI: Marco Baratieri
2017-2018	Third party contract (Yanmar)	Analysis of European small scale GASification technologies and identification of new SOLUTIONs (GASSOLUTION), PI: Marco Baratieri
2016-	FUB internal	BIOmass-to-LIQuid as a strategy to

2018	funding, (CRC call 2016)	enhance gasification potential in a biorefinery perspective (BIO2LIQ), PI: Marco Baratieri
2016-2018	Provincia Autonoma di Bolzano (L.P., 13.12.2006, N. 14)	Novel EXTension of biomass poly-GENERATION to small scale gasification systems in South-Tyrol (NEXT GENERATION), PI: Marco Baratieri

Publications

Journal articles in refereed academic journals:

1. A. Abdelaal, D. Antolini, *S. Piazzi*, F. Patuzzi, A. Villot, C. Gerente, M. Baratieri. Steam reforming of tar using biomass gasification char in a Pilot-scale gasifier. Fuel, vol. 110, 2023
   DOI: 10.1016/j.fuel.2023.128898
   Journal Impact Factor: 7.4 (2023)
2. R. Booroah, D. Antolini, *S. Piazzi*, E. Cordioli, F. Patuzzi, M. Baratieri. Investigations into the performance and emissions of a small-scale CHP system using producer gas obtained from gasification of forest residues. Journal of the Energy Institute, vol. 110, 2023
   DOI: 10.1016/j.joei.2023.101354
   Journal Impact Factor: 5.7 (2023)
3. P. Postacchini, L. Menin, *S. Piazzi*, A. Grimalt-Alemany, F. Patuzzi, M. Baratieri. Syngas biomethanation by co-digestion with brewery spent yeast in a lab-scale reactor. Biochemical Engineering Journal, vol. 193, 2023
   DOI: 10.1016/j.bej.2023.108863
   Journal Impact Factor: 3.9 (2023)
4. D. Antolini*, *S. Piazzi**, L. Menin, F. Patuzzi, M. Baratieri (*Dual-first authorship). High hydrogen content syngas for biofuels production from biomass air gasification: Experimental evaluation of a char-catalyzed steam reforming unit. International Journal of Hydrogen Energy, vol. 47, no. 64, pp. 27421-27436, 2022
   DOI: 10.1016/j.ijhydene.2022.06.075
   Journal Impact Factor: 7.139 (2021)
5. *S. Piazzi*, F. Patuzzi, M. Baratieri. Energy and exergy analysis of different biomass gasification coupled to Fischer-Tropsch synthesis configurations. Energy, vol. 249, 2022
   DOI: 10.1016/j.energy.2022.123642
   Journal Impact Factor: 8.857 (2021)
6. F. Patuzzi, D. Basso, S. Vakalis, D. Antolini, *S. Piazzi*, V. Benedetti, E. Cordioli, M. Baratieri. State-of-the-art of small-scale biomass gasification systems: an extensive and unique monitoring review. Energy, vol. 223, 2021
   DOI: 10.1016/j.energy.2021.120039
   Journal Impact Factor: 8.857 (2021)
7. *S. Piazzi*, L. Menin, D. Antolini, F. Patuzzi, M. Baratieri. Potential to retrofit existing small-scale gasifiers through steam gasification of biomass residues for hydrogen and biofuels production. International Journal of Hydrogen Energy, vol. 46, no. 13, pp. 8972-8985, 2021
   DOI: 10.1016/j.ijhydene.2021.01.004
   Journal Impact Factor: 7.139 (2021)
8. *S. Piazzi*, S.S. Ail, V. Benedetti, F. Patuzzi, M. Baratieri. Fuel-lean combustion synthesized cobalt catalysts for Fischer-Tropsch reaction. Catalysis Today, vol. 379, pp. 105-113, 2020.

DOI: 10.1016/j.cattod.2020.06.088
Journal Impact Factor: 6.766 (2020)

9. *S. Piazzi*, X. Zhang, F. Patuzzi, M. Baratieri. Techno-economic assessment of turning gasification-based waste char into energy: A case study in South-Tyrol. Waste Management, vol. 105, pp. 550–559, 2020.
DOI: 10.1016/j.wasman.2020.02.038
Journal Impact Factor: 7.145 (2020)

Conference papers:

1. *S. Piazzi*, D. Antolini, L. Menin, F. Patuzzi, M. Baratieri, Experimental Analysis of Producer Gas Upgrade Over a Char Bed Reactor for Enhanced Hydrogen Yield, in: 30th Eur. Biomass Conf. Exhib., pp. 790-793, 2022
DOI: 10.5071/30thEUBCE2022-4CV.5.7
2. *S. Piazzi*, L. Menin, D. Antolini, F. Patuzzi, M. Baratieri, Studies on conversion of biomass-residues to syngas for biofuels through steam gasification, in: 28th Eur. Biomass Conf. Exhib., pp. 440 - 444, 2020
DOI: 10.5071/28thEUBCE2020-2CV.3.19
3. *S. Piazzi*, S.S. Ail, V. Benedetti, F. Patuzzi, M. Baratieri, Studies on conversion of biomass derived syngas to liquid fuels via Fischer-Tropsch synthesis, in: 27th Eur. Biomass Conf. Exhib., pp. 1262–1265, 2019
DOI: 10.5071/27thEUBCE2019-3CV.3.7.

Other publications:

1. L. Menin, *S. Piazzi*, D. Antolini, A. Gasparella, M. Baratieri. Green Hydrogen for the Alps - A meta-study on renewable hydrogen uses, production, and policy priorities. EUSALP - Action Group 9 – Energy.
https://www.alpine-region.eu/publications/green-hydrogen-alps-meta-study-renewable-hydrogen-uses-production-and-policy-priorities

Further data

Oral Presentations:

- 7th International Conference on Engineering for Waste and Biomass Valorisation (WasteEng) 2018 - Energy Conversion of Gasification Residual Char: Combustion and Co-firing Scenarios in Northern Italy - *S. Piazzi*, X. Zhang, F. Patuzzi, M. Baratieri
- 5th International Conference Catalysis for Renewable Sources: Fuel, Energy, Chemicals (CRS-5) 2019 - Influences of supported catalyst synthesis method on the conversion of biomass-derived syngas to biofuels via Fischer-Tropsch synthesis - *S. Piazzi*, S. S. Ail, V. Benedetti, F. Patuzzi, M. Baratieri
- 9th International Conference on Sustainable Solid Waste Management (CORFU2022) 2022 - Small-scale producer gas upgrading: hydrogen yield enhancement over a char bed reactor - S. Piazzi, D. Antolini, L. Menin, M. Baratieri, F. Patuzzi

Poster Presentations:

- World Sustainable Energy Days (WSED) 2018 - Systematic assessment of turning gasification-based waste char to energy: a case study in South Tyrol (Italy) - *S. Piazzi*, X. Zhang, F. Patuzzi, M. Baratieri
- 26th European Biomass Conference & Exhibition (EUBCE) 2018 -

Combined generation of fuels and electricity from woody biomass gasification - A techno-economic analysis - S. S. Ail, *S. Piazzi*, D. Basso, F. Patuzzi, S. Kumar, M. Baratieri
- 27th European Biomass Conference & Exhibition (EUBCE) 2019 - Studies on conversion of biomass-derived syngas to liquid fuels via Fischer-Tropsch Synthesis - *S. Piazzi*, S. S. Ail, V. Benedetti, F. Patuzzi, M. Baratieri
- 28th European Biomass Conference & Exhibition (eEUBCE) 2020 - Studies on conversion of biomass-residues to syngas for biofuels through steam gasification - *S. Piazzi*, L. Menin, D. Antolini, F. Patuzzi, M. Baratieri
- 29th European Biomass Conference & Exhibition (eEUBCE) 2021 - A first and second law thermodynamic analysis of different biomass gasification coupled to Fischer-Tropsch synthesis - *S. Piazzi*, F. Patuzzi, M. Baratieri

Statement of interest

The research experience gained during my Post-Doc, PhD program and in the previous years is related with the design and operation of biomass to biofuels systems at the lab- and pilot-scale. I have experience in the overall characterization of the process, which includes both the mass and energy fluxes analysis and the feedstock and products characterization, including both solid/liquid materials characterization and online/offline gas analysis. These analyses have been carried out also on full-scale gasification plants. Moreover, the experience I have in the design of lab- and pilot-scale setup can help in the design of new systems for the conversion of biomass to liquid/gaseous biofuels. Whether of interest, I can also contribute to the presentation of the obtained results at international conferences and/or their publication in scientific journals. Finally, I have gained experience also in the development of techno-economic models to analyze the feasibility of a technology of interest, using different software, e.g. Aspen Plus, DWSIM, Matlab and Python.

Language competence

Italian: Mother tongue
English: C1 (Certified by Master's Degree in English)
German: B1 (Internal UNIBZ B1 certificate)

Driving license

Type A and B

The undersigned gives his consent to his personal data being processed, within the limits of the legislative decree 196/2003, for formalities connected with the present procedure.

Date
03.09.24

Signature