

Francesco Patuzzi – Academic Curriculum Vitae

Personal information

Francesco Patuzzi

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Education since leaving school

- 2007, Bachelor in Environmental Engineering, University of Trento
- 2010, Master in Environmental Engineering, University of Trento
- 2014, Phd in Management of Mountain Environment, Free University of Bozen-Bolzano

Present appointment

- Associate Professor in thermal engineering and industrial energy systems, disciplinary sector ING-IND/10
- Start of appointment: 01.03.2023
- Employer: Free University of Bozen-Bolzano, Faculty of Engineering

Professional experience

Period: 01/10/2022 – 28/02/2023

Employer:

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

Activity:

Associate Professor in thermal engineering and industrial energy systems, disciplinary sector ING-IND/10

Period: 01/10/2019 – 30/09/2022

Employer:

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

Activity:

Researcher on a fixed-term contract (RTDb, ex art. 24 L. 240/2010), disciplinary sector ING-IND/10 (Thermal engineering and industrial energy systems)

Period: 01/07/2017 – 30/09/2019

Employer:

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

Activity:

Researcher on a fixed-term contract (RTDa, ex art. 24 L. 240/2010), disciplinary sector ING-IND/10 (Thermal engineering and industrial energy systems).

Area of reseach:

the research field deals with the study of the processes of heat transfer and with the thermofluidynamic behavior of combined heat and power systems fed by renewable sources, in particular by biomass.

Activities: teaching and research activities relevant to the ING-IND/10 sector. This research area aims to the study of distributed cogeneration technologies which are most promising, in order to valorise the local biomass utilization in South-Tyrol, increase the conversion processes' efficiency and contribute to the mitigation of environmental impacts. Novel processes whose aim is solid fuels (biomass and waste) upgrade into intermediate fuels (solid, liquid and gaseous) are of particular significance, as gasification and

pyrolysis. The research focuses in particular on: 1) biomass characterization, i.e. analysis of physical-chemical and energetic characteristics; 2) experimental and modelling analysis of energy conversion processes and systems; 3) characterization of the gasification/pyrolysis products and by-product and their valorization to generate heat, electricity and chemicals. The research methods, experimental and theoretical, will be applied both at the laboratory and at the pilot scale. It is foreseen to present the research results both to the scientific audience and as informative paper/speech and also on the media, in the area of the energy generation from biomass.

Period: 15/02/2016-30/06/2017

Employer:

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

Activity:

Researcher on a fixed-term contract (RTDa, ex art. 24 L. 240/2010), disciplinary sector ING-IND/10 (Thermal engineering and industrial energy systems). RTD research.

Area of research:

study of distributed cogeneration technologies which are most promising, in order to valorize the local biomass production in South-Tyrol, increase the conversion processes' efficiency and contribute to the mitigation of environmental impacts.

Activities: the research focuses on the biomass characterization, i.e. analysis of physicalchemical characteristics and reactivity, on the characterization of the gasification/pyrolysis products and by-product and their valorization to generate heat, electricity and chemicals. The research methods, experimental and theoretical, are applied both at the laboratory and at the pilot scale.

Period: 01/2015 – 02/2016

Employer:

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

Activity:

Post-doc research fellow. Project title: "Thermochemical conversion of biomass: reactivity and process analysis (Conversione termochimica di biomasse: reattività e analisi di processo)"

Competence area:

Evaluation, at the particle scale, of the biomass reactivity during a thermochemical conversion process, by means of thermogravimetric analysis and the development of kinetic models. Characterization of biomass gasification process at different levels, by means of on-site monitoring of existing plants and experimental analysis on bench-scale reactors, in order to design a pilot plant to be installed at the Free University of Bozen-Bolzano.

Period: 01/2014 – 01/2015

Employer:

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

Activity:

Post-doc research fellow. Project title: "Gasification Experiences in South Tyrol: energy and environmental assessment"

Competence area:

On-site monitoring of small-scale biomass gasification plant. Characterization of producer gas and engine emissions. Sampling and analysis of liquid (tar) and solid (char) by-products.

Assessment of the energy balance of the plants by means of the analysis of the data collected during the monitoring activity. Identification of the criticalities in the analyzed technologies. Proposal and feasibility evaluation of technical improvements on the selected plants.

Period: 08/2010 – 12/2010

Employer:

Free University of Bozen, Faculty of Science and Technology

Activity:

Scientific collaborator in the international research project "Sustainable water management and wetland restoration in settlements of continental-arid Central Asia" (SuWaRest), funded by the Stifterverband für die Deutsche Wissenschaft

Competence area:

Research on the use of wetland biomass, in particular reed (*Phragmites australis*) for energy production; characterization of the feedstock (reed) and its energy exploitation starting from the productivity and nutrient uptake data; individuation and feasibility evaluation of different scenarios of energy conversion of reed, according to its characteristics (composition and heating value) and keeping into account both pyrolysis and gasification paths; assessment of the process efficiency, by means of thermodynamic modeling and experimental characterization applied at the process scale.

Period: 06/2010 – 07/2010

Employer:

University of Trento, Department of Civil and Environmental Engineering (DICA)

Activity:

Scientific collaborator in the research project: Analisi sperimentale e modellistica del processo di torrefazione delle biomasse legnose (Experimental and modelling analysis of the torrefaction process of lignocellulosic biomass)

Competence area:

Investigation of the different stages of the torrefaction of woody biomass with particular emphasis on modeling analysis of solid, liquid and gaseous phases; assessment of the effectiveness of this process in the increase of the calorific value of biomass; check of the impact on emission's products arising from the use of biomass in the combustion processes and/or gasification.

Experience in academic teaching

Lectures

2023 – 2024

Free University of Bozen, Faculty of Engineering

- Lecturer of the course "Computational thermo-fluid-dynamics", within the Master in Industrial and Mechanical Engineering
- Lecturer of the course "Thermo-mechanical measurements", within the Master in Industrial and Mechanical Engineering
- Lecturer of the course "Engineering energetics", within the Bachelor in Industrial and Mechanical Engineering
- Lecturer of the course "Misurazioni Meccaniche e Modellazione Numerica", within the Bachelor in Industrial and Mechanical Engineering

2022 – 2023

Free University of Bozen, Faculty of Science and Technology

- Lecturer of the course "Computational thermo-fluid-dynamics", within the Master in Industrial and Mechanical Engineering
- Lecturer of the course "Thermo-mechanical measurements", within the Master in Industrial and Mechanical Engineering
- Lecturer of the course "Engineering energetics", within the Bachelor in Industrial and Mechanical Engineering

2021 – 2022

Free University of Bozen, Faculty of Science and Technology

- Lecturer of the course "Fundamentals of thermo-fluid-dynamics", within the Master in Industrial and Mechanical Engineering
- Lecturer of the course "Thermo-mechanical measurements", within the Master in Industrial and Mechanical Engineering
- Lecturer of the course "Energetics", within the Bachelor in Industrial and Mechanical Engineering

2020 – 2021

Free University of Bozen, Faculty of Science and Technology

- Lecturer of the course "Fundamentals of thermo-fluid-dynamics", within the Master in Industrial and Mechanical Engineering
- Lecturer of the course "Thermo-mechanical measurements", within the Master in Industrial and Mechanical Engineering
- Lecturer of the course "Energetics", within the Bachelor in Industrial and Mechanical Engineering

2019 – 2020

Free University of Bozen, Faculty of Science and Technology

- Lecturer of the course "Fundamentals of thermo-fluid-dynamics", within the Master in Industrial and Mechanical Engineering
- Lecturer of the course "Energetics", within the Bachelor in Industrial and Mechanical Engineering

2018 – 2019

Free University of Bozen, Faculty of Science and Technology

- Lecturer of the course "Fundamentals of thermo-fluid-dynamics", within the Master in Industrial and Mechanical Engineering
- Lecturer of the course "Energetics", within the Bachelor in Industrial and Mechanical Engineering

2017 – 2018

Free University of Bozen, Faculty of Science and Technology

- Lecturer of the course "Fisica tecnica per i processi alimentari 1", within the Bachelor in Agricultural and Agro-Environmental Sciences
- Lecturer of the course "Fisica tecnica per i processi alimentari 2", within the Bachelor in Agricultural and Agro-Environmental Sciences
- Lecturer of the module "Impianti alimentati da fonti rinnovabili", within the Master 2nd level "BEE: Building, Energy and Environment – CasaClima"

2016 – 2017

Free University of Bozen, Faculty of Science and Technology

- Lecturer of the course "Tools for empirical and numerical assessment of energy systems", within the PhD program in Sustainable Energy and Technologies (SET)

2014 – 2015

Free University of Bozen, Faculty of Science and Technology

- Lecturer of the course "Applicazioni delle norme sull'efficienza energetica in edilizia", within the Bachelor in Industrial and Mechanical Engineering
- Lecturer of the module "I sistemi impiantistici per la produzione del caldo e del freddo – Exercise", within the Master 2nd level "Building Energy Performance. Design, Optimization and Service – CasaClima"
- Lecturer of the module "Impianti alimentati da fonti rinnovabili – Exercise", within the Master 2nd level "Building Energy Performance. Design, Optimization and Service – CasaClima"

2013 – 2014

University of Trento, Faculty of Engineering

- Teaching Assistant for the course "Risorse Energetiche del Territorio", within the Master in Environmental Engineering

2012 – 2013

Free University of Bozen, Faculty of Science and Technology

- Teaching Assistant for the course "Fisica", within the Bachelor in Agricultural and Agro-Environmental Sciences

Thesis supervision, co-supervision and tutoring

2019 – now Supervisor of 1 Postdoc, 1 PhD, 1 Master and 3 Bachelor Students, Free University of Bozen/Bolzano, Faculty of Science and Technology (Faculty of Engineering since 03.2023), Italy

2013 – now Co-supervisor of 13 PhD, 10 Master Student and 3 Bachelor Students, Free University of Bozen/Bolzano, Faculty of Science and Technology (Faculty of Engineering since 03.2023), Italy

Other academic responsibilities

Institutional activities

- Director of the Study Program "Professional Bachelor in Wood Technology", LP-03 (since 2023)
- Member of the Study Council of the PhD Program in "Sustainable Energy and Technology" (A.Y. 2016-17)
- Member of the Study Council of the PhD Program in "Food Engineering and Biotechnology" (since A.Y. 2017-18)
- Second member (vice-coordinator) of the Study Council of the Study Program "Professional Bachelor in Wood Engineering", L-9 (since A.Y. 2018-19)
- Second member (vice-coordinator) of the Study Council of the Study Program "Professional Bachelor in Wood Technology", LP-03 (since A.Y. 2022-23)

Participation to scientific committees of conferences

- Member of the Scientific committee as Topic Organizer of the 32nd European Biomass Conference & Exhibition (EUBCE2024) that will be held from June 24th to June 27th in Marseille, France

- Member of the Students Tutoring Scientific Committee in the frame of the international conference Building Simulation Applications - BSA 2022, that will be held at the Free University of Bozen-Bolzano from June 29th to July 1st 2022.
- Member of the Students Tutoring Scientific Committee in the frame of the international conference Building Simulation Applications - BSA 2019 held at the Free University of Bozen-Bolzano from June 19th to 21st 2019.
- Member of the Students Tutoring Scientific Committee in the frame of the international conference Building Simulation Applications - BSA 2017 held at the Free University of Bozen-Bolzano from February 8th to 10th 2017.

Participation to organizing committees of conferences

- Member of the Awards Committee of the 9th International Conference on Engineering for Waste and Biomass Valorisation (WasteEng2022), held from June 27^{sh} to June 30th 2022 in Copenhagen, Denmark.
- Member of the organizing committee of the international conference Building Simulation Applications - BSA 2022, that has been held at the Free University of Bozen-Bolzano from June 29th to July 1st 2022.
- Member of the Awards Committee of the 8th International Conference on Engineering for Waste and Biomass Valorisation (WasteEng2020), held from May 31st to June 4th 2021 in virtual mode.
- Member of the organizing committee of the "EU-Japan biomass seminar" hosted by the 27th European Biomass Conference & Exhibition on May 27th 2019 in Lisbon, Portugal
- Member of the organizing committee of the "Biomass Study Tour in South Tyrol", held on May 23rd and 24th in South Tyrol in the frame of the "EU-Japan biomass seminar" hosted by the 27th European Biomass Conference & Exhibition on May 27th 2019 in Lisbon, Portugal
- Member of the local organizing committee of the 16th IBPSA International Conference and Exhibition - BS 2019, held in Rome from September 2nd to 4th 2019.
- Member of the organizing committee of the international conference Building Simulation Applications - BSA 2019, held at the Free University of Bozen-Bolzano from June 19th to 21st 2019.
- Member of the organizing committee of the international conference Building Simulation Applications - BSA 2017, held at the Free University of Bozen-Bolzano from February 8th to 10th 2017.
- Member of the organizing committee of the international conference μ CHP 16 – micro cogeneration through biomass gasification, held at the Free University of Bozen-Bolzano on December 2nd and 3rd 2016.
- Member of the organizing committee of the international conference Building Simulation Applications - BSA 2015, held at the Free University of Bozen-Bolzano from February 4th to 6th 2015.

- Member of the organizing committee of the international conference Building Simulation Applications - BSA 2013, held at the Free University of Bozen-Bolzano from January 30th to February 1st 2013.

Participation to editorial boards

- Member of the editorial board of Building Simulation Applications (BSA) Proceedings, a periodic publication (ISSN: 2531-6702) by bu,press, the publisher of the Free University of Bozen-Bolzano
- Guest editor of the "Proceedings of 2018 EEC/WTERT Conference" published by ASME
- Member of the Topical Advisory Panel of "Resources" journal (ISSN 2079-9276) by MDPI
- Review Editor on the Editorial Board of Environmental Systems Engineering (specialty section of Frontiers in Environmental Science, ISSN 2296665X, IF 4.581)
- Review Editor on the Editorial Board of Waste Management (specialty section of Frontiers in Sustainability)
- Member of the Editorial Board of "Resources" journal (ISSN 2079-9276) by MDPI

Session chair at international scientific conferences

- 6th International Conference on Engineering for Waste and Biomass Valorisation, Albi, France – May 25th, 2016, session C6 – Gasification of sludge
- 8th International Conference on Applied Energy, Beijing, China – October 10th, 2016, session 2-J2 – Industrial Energy System
- 7th International Conference on Engineering for Waste and Biomass Valorisation, Prague, Czech Republic – July 2nd, 2018, session D3 – Gasification & pyrolysis I: experimental performance
- 27th European Biomass Conference & Exhibition, Lisbon, Portugal – May 28th, 2019, session IBO.16 – Innovation in combustion plants, ORC cycles and electrolyser development
- 16th Building Simulation 2019, Rome – September 3rd, 2019, session 247: CFD and Airflow – 04: Natural Ventilation
- 16th Building Simulation 2019, Rome – September 4th, 2019, session 334: Energy Storage – 03
- 6th Central European Biomass Conference, Graz, Austria – January 24th, 2020, Parallel Session 18: Technologies for decentral bioelectricity production
- 29th European Biomass Conference & Exhibition, virtual edition – April 27th, 2021, session 2BO.8 - Gasification Process Analysis and Optimization
- 8th International Conference on Sustainable Solid Waste Management (Thessaloniki2021), virtual edition – June 25th, 2021, session XVII - Energy from Waste I / Management of Construction & Demolition Waste
- 9th International Conference on Sustainable Solid Waste Management (CORFU2022), Corfu, Greece – June 15th, 2022, session VI - Tools in the field of waste management

- 9th International Conference on Engineering for Waste and Biomass Valorisation, Copenhagen, Denmark – June 29th, 2022, session OF4-10 – Activated carbons
- Session chair at the 31st European Biomass Conference and Exhibition (EUBCE 2023), held in Bologna from 5th to 8th June 2023, Session 4AO.2: Piloting of novel gasification-to-power pathways and supporting research, 5th June, Session 4BV.5: Gasification-to-power research and development progress, 6th June 2023
- Session chair at the 10th International Conference on Sustainable Solid Waste Management (CHANIA2023), Chania, Greece – June 23rd, 2023, session WASTE VALORIZATION IV

Reviewer for international scientific journals

- Biomass & Bioenergy
- Waste and Biomass Valorization
- Energy Conversion and Management
- Energy
- Waste Management
- Experimental Thermal and Fluid Science
- Energies
- Renewable & Sustainable Energy Reviews
- Renewable Energy
- Processes
- International Journal of Hydrogen Energy

Third mission – divulgation activities

- March 2015: presentation of the results of the GAST project during the final workshop, open to a specialized non-scientific public during the fiera Klimaenergy
- September 2015: invited speaker at the Open-day sulla gassificazione, University of Modena and Reggio Emilia, Tecnopolo di Modena: "Analisi degli impianti di gassificazione di piccola taglia in Alto Adige", open to a specialized non-scientific public
- September 2016: participation to the Lange Nacht der Forschung – LUNA, presenting the Bioenergy & Biofuels LAB and running the open top gasifier
- April 2017: thematic lesson "Combustibili alternativi ed efficienza energetica" at IIS Galilei (Bolzano) and presentation of the Bachelor Program in Industrial and Mechanical Engineering offered by the Faculty of Science and Technology at the Free University of Bozen-Bolzano
- October 2017: participation to the inauguration of the NOI Techpark, presenting the activities of the Bioenergy & Biofuels LAB
- May 2018: presentation of the results of the NEXT GENERATION project during the final workshop, open to a specialized non-scientific public
- October 2018: participation to the miniNOI activities, presenting the Bioenergy & Biofuels LAB and the topics related to biomass utilization to groups of children (6-12 years old).
- October 2021: presentation at the Sparkasse Academy after the conferral of the Research Award 2021 from the Stiftung Südtiroler Sparkasse in front of the Sparkasse

steering body: "Stato dell'arte dei sistemi di gassificazione di biomassa di piccola scala: risultati da un'estensiva campagna di monitoraggio"

- May 2022: presentation at the technical fair "Progetto Fuoco" in Verona: "Nuove sfide per il settore della gassificazione: biomasse residuali e biochar di qualità"
- February 2024: presentation at the technical fair "Progetto Fuoco" in Verona: "Produzione di Biochar tramite pirolisi e gassificazione di biomasse di scarto: risultati del progetto Alps4GreenC"

Third mission – technology transfer activities

- Since 2020: Scientific advisor for the foundation of a start-up company, initiative that actively involves some members of the Bioenergy & Biofuels research group (Daniele Antolini, Stefano Piazzini and Lorenzo Menin), who have been selected in October 2020 in the Pre-Incubation Program of the Start-up Incubator of NOI Techpark and participated in the training course aimed at the design and implementation of the start-up BiSTEMS, that has been funded in the early 2022.

Qualification

Abilitazione Scientifica Nazionale (ASN) achieved on 04/04/2017 (II fascia, settore 09/C2)

Memberships

- Member of the Association of Engineers of Verona from 2011 to the end of 2014.
- Member of the Italian Association of Technical Physics since April 2016.
- Member of the IBPSA-Italy since May 2018.

Research and scholarships

- 02/2016 – 06/2017
- Researcher on a fixed-term contract (RTDa, ex art. 24 L. 240/2010), disciplinary sector ING/IND 10 (Thermal engineering and industrial energy systems)
- Free University of Bozen-Bolzano, Faculty of Science and Technology
- Area of research: study of distributed cogeneration technologies which are most promising, in order to valorize the local biomass production in South-Tyrol, increase the conversion processes' efficiency and contribute to the mitigation of environmental impacts.
- Activities: the research focuses on the biomass characterization, i.e. analysis of physicalchemical characteristics and reactivity, on the characterization of the gasification/pyrolysis products and by-product and their valorization to generate heat, electricity and chemicals. The research methods, experimental and theoretical, are applied both at the laboratory and at the pilot scale.
- Funding body: Autonomous Province of Bolzen-Bolzano (TechPark)
- 01/2015 – 02/2016
- Post-doc research fellowship
- Free University of Bozen-Bolzano, Faculty of Science and Technology

- Project title: "Thermochemical conversion of biomass: reactivity and process analysis (Conversione termochimica di biomasse: reattività e analisi di processo)"
- Evaluation, at the particle scale, of the biomass reactivity during a thermochemical conversion process, by means of thermogravimetric analysis and the development of kinetic models. Characterization of biomass gasification process at different levels, by means of on-site monitoring of existing plants and experimental analysis on bench-scale reactors, in order to design a pilot plant to be installed at the Free University of Bozen-Bolzano.
- Funding body: Autonomous Province of Bolzen-Bolzano (TechPark)
- 01/2014 – 01/2015
- Post-doc research fellowship
- Free University of Bozen-Bolzano, Faculty of Science and Technology
- Project title: "Gasification Experiences in South Tyrol: energy and environmental assessment"
- On-site monitoring of small-scale biomass gasification plant. Characterization of producer gas and engine emissions. Sampling and analysis of liquid (tar) and solid (char) by-products. Assessment of the energy balance of the plants by means of the analysis of the data collected during the monitoring activity. Identification of the criticalities in the analyzed technologies. Proposal and feasibility evaluation of technical improvements on the selected plants.
- Funding body: Autonomous Province of Bolzen-Bolzano (GAST project)
- 2011 – 2014
- PhD on Management of Mountain Environment – XXVI cycle
- Free University of Bolzano, Faculty of Science and Technology
- Modeling and experimental characterization of biomass thermal treatment: torrefaction and pyrolysis applied to wetland and grass biomasses; Supervisor: Dr. Ing. Marco Baratieri; Co-Supervisor: Dr. Tanja Mimmo.
- Funding body: Stifterverband für die Deutsche Wissenschaft (within the frame of the international research project SuWaRest, Sustainable water management and wetland restoration in settlements of continental-arid Central Asia)

International research experiences

- Period: 22/02-22/06/2013
- Location: City College of New York, New York, USA
- Main activities and responsibilities: Experimental study of biomass reactivity, investigated through the thermal characterization of a particle subjected to pyrolysis and the analysis of the evolved gas.
- Period: 21/10-06/11/2011
- Location: China (Wuliangshai Lake, Inner Mongolia)
- Main activities and responsibilities: Scientific expedition in the frame of the research project Sustainable water management and wetland restoration in settlements of continental-arid Central Asia (SuWaRest): collection of reed

samples on the Wuliangsu Hai Lake area that will be processed in the lab scale pyrolysis reactor built at FUB; interviews to local experts and people in order to understand the situation of energy management in the area.

- Period: 07-19/09/2010
- Location: China (oases Xinan at the Wuliangsu Hai Lake, Inner Mongolia, and Wujiang, near to Zhangye, at the Heihe River, in Gansu Province)
- Main activities and responsibilities: Scientific expedition in the frame of the research project Sustainable water management and wetland restoration in settlements of continental-arid Central Asia (SuWaRest): knowledge of the German and Chinese cooperation partners; knowledge of the local stakeholders; visiting and primary analysis of the study sites; collection of some reeds samples.

List of research grants and contracts as participant

Period	Funding Body	Title
2023-2026	EFRE 2021-2027	Sustainable heating systems for decarbonizing buildings (SustainHEAT)
2019 – 2021	unibz (RTD call 2019)	Pollutant abatement solutions for small-scale cogeneration systems and combustion systems fed with traditional and alternative fuels (CLEAN POWER)
2018 – today	EFRE 2014-2020	Hydrothermal carbonization of Biogas digestate for hydroPonics: an innovative concept of bio-refinery (HB Ponics)
2018	Third party contract (Municipality of Bozen-Bolzano)	Technical and economic analysis of the district heating system in the Municipality of Bozen-Bolzano (DH-BZ)
2017 – 2021	FUB internal funding, (ZeFo)	ThERmo-fluid DYnamics of Solid fuels Conversion systems: Optimization strategies (THE_DYSCO)
2017 – 2021	Austrian Research Promotion Agency (BRIDGE Early Stage)	Increased fuel flexibility and modulation capability of fixed-bed biomass gasifiers by means of model based control (FlexiFuelGasControl)
2016 – 2020	EFRE 2014-2020	Optimization of WOOD gasification chain in South Tyrol to produce bio-energy and other high-value green products to enhance soil fertility and mitigate climate change (WOODUP)
2016 – 2018	FUB internal funding, (ZeFo)	BIOmass-to-LIQuid as a strategy to enhance gasification potential in a biorefinery perspective (BIO2LIQ)
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)
2013-2015	Provincia Autonoma di Bolzano (L.P., 13.12.2006, N. 14), period: 2012-2014	Experiences in biomass Gasification in South - Tyrol: energy and environmental assessment (GAST)
2015 – 2016	Third party contract (Risanenergy srl)	On-site monitoring and the assessment of a plant for the pyrolysis of sewage sludge
2013 – 2020	Provincia Autonoma di Bolzano	Sviluppo della ricerca tecnologica: Convenzione programmatico-finanziaria con la Provincia Autonoma di Bolzano (Nuovo Parco Tecnologico, BZ)
2011 – 2013	FUB internal funding, (ZeFo)	Bench scale pyrolysis and torrefaction of lignocellulosic biomass: process characterization, byproducts analysis and transformation
2010 – 2013	Stifterverband für die Deutsche Wissenschaft (Germany)	Sustainable water management and wetland restoration in settlements of continental-arid Central Asia (SuWaRest)

List of research grants and contracts as PI or co-PI

Period	Funding Body	Title
2023-2025	EFRE 2021-2027	Recupero di nutrienti dal processo HTC (RFD), PI: HBI srl, Italy, unibz unit responsible: Francesco Patuzzi
2024-2026	ERDF 2021-2027	CompostDiVino (CDV), PI: Biologik srl, Italy; unibz unit responsible: Marco Baratieri, unibz unit co-responsible: Francesco Patuzzi
2023-2025	PRIN 2022	Decarbonized and Circular hydrogeN prOducTion through biomass and waste gasification (CARNOT), PI: Unige, Italy; unibz unit responsible: Marco Baratieri, unibz unit co-responsible: Francesco Patuzzi
2023-2024	Third party contract (AGSM AIM Energia spa)	Sewage Sludge Combustion (SSC), PI: Marco Baratieri, co-PI: Francesco Patuzzi
2023-2024	Alpine Space 2021-2027	Implementation pathways for sustainable Green Carbon production in the Alpine Region (Alps4GreenC), PI: Marco Baratieri, co-PI: Francesco Patuzzi
2023	Third party contract (RECORD)	Testing of plastic materials in a batch gasification system (G-PLAST), PI: Francesco Patuzzi, co-PI: Marco Baratieri
2023	Third party contract (EcoBEE)	Calibration of an innovative sensor for benzene detection (SENS-C6H6), PI: Marco Baratieri, co-PI: Francesco Patuzzi
2022-2023	Third party contract (KWB)	Test of biomass boilers fed with agricultural residues (BOIL-RES), PI: Marco Baratieri, co-PI: Francesco Patuzzi
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, co-PI: Francesco Patuzzi
2022	Third party contract (HBI srl)	On-site monitoring of HBI integrated hydrothermal carbonization and gasification plant in Fusina (HBI_2), PI: Francesco Patuzzi, co-PI: Marco Baratieri
2021-2022	Third party contract (M.c. System srl)	Sviluppo, progettazione e test in campo di un macchinario per la separazione della posidonia dalla sabia (POSIDONIA), PI: Francesco Patuzzi, co-PI: Marco Baratieri
2021	Third party contract (HBI srl)	On-site monitoring of HBI integrated hydrothermal carbonization and gasification plant (HBI), PI: Francesco Patuzzi, co-PI: Marco Baratieri
2021-2024	European Commission, Horizon 2020 Framework Programme (Green Deal)	A FRONTrunner approach to Systemic circular, Holistic & Inclusive solutions for a new Paradigm of territorial circular economy (FRONTSHIP), PI: K-FLEX, Poland; unibz unit PI: Marco Baratieri, unibz unit co-PI: Francesco Patuzzi
2021 – 2022	Third party contract (Biologik Systems srl)	Development of a composting technology for agricultural and forestry residues (BIOLOGIK), PI: Francesco Patuzzi, co-PI: Marco Baratieri
2020 - 2022	Third party contract (SAUBER s.r.l.)	AgroAlimentary and agroForestry by-products: Thermochemical Evolution pRocess (AFTER), PI: Marco Baratieri, co-PI: Francesco Patuzzi
2020 – 2022	unibz (RTD call 2020)	Small-scale producer gas upgrading for biofuels production (SMUP), PI: Francesco Patuzzi
2020 – 2023	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, co-PI: Francesco Patuzzi

2020	Third party contract (TerraX)	Technical and economic feasibility of producing hydrogen by gasification of lignocellulosic biomass in South Tyrol (HydroST), PI: Marco Baratieri, co-PI: Francesco Patuzzi
2019 – 2020	Third party contract (Palazzetti spa)	Gasification for improved combustion in a biomass STOVE (GASTOVE), PI: Marco Baratieri, co-PI: Francesco Patuzzi
2019 – 2023	Italian Ministry of Education, University and Research (PRIN 2017)	BIOMasses Circular Holistic Economy Approach to EneRgy equipments (BIO-CHEAPER), PI: Marco Baratieri, co-PI: Francesco Patuzzi
2018 – 2021	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, co-PI: Stergios Vakalis
2018	Third party contract (BIT spa)	BIomass planT monitoring (BIT), PI: Marco Baratieri, co-PI: Francesco Patuzzi
2018	Third party contract (Yanmar)	KINetics analysis of char bed Gasification (KING), PI: Marco Baratieri, co-PI: Francesco Patuzzi
2018	Third party contract (Yanmar)	Pre-design assessments of different reactor concepts (PRE-DES), PI: Marco Baratieri, co-PI: Francesco Patuzzi
2017 – 2018	Third party contract (Yanmar)	Analysis of European small scale GASification technologies and identification of new SOLUTIONs (GASSOLUTION), PI: Marco Baratieri, co-PI: Francesco Patuzzi
2017	Third party contract (Synecom)	Analysis of the pyrolysis process applied to tyres and plastic residues Contract for research project (PYROTYRE), PI: Marco Baratieri, co-PI: Francesco Patuzzi

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Bibliometrics indexes (21/03/2024)

Google Scholar	175 papers	2149 citations	H-index=26
Scopus	99 papers	1611 citations	H-index=22
ISI Web of Science	80 papers	1382 citations	H-index=20

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4. Basso, D., Cordioli, E., Bonadio, E., **Patuzzi, F.**, Dal Savio, S., Mimmo, T., Baratieri, M.: Stato dell'arte della gassificazione di biomasse legnose in Alto Adige e analisi tecnico-economica sui possibili miglioramenti verso un assetto poligenerativo. In: Tonon, G. (ed.) WOOD-UP - Valorizzazione della filiera di gassificazione di biomasse legnose per l'energia, la fertilità del suolo e la mitigazione dei cambiamenti climatici. pp. 5–46. bu,press - Bozen-Bolzano University press, Bolzano, Italy (2020)
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63. Hollenstein, C., Zemann, C., Martini, S., Göllés, M., Felsberger, W., Antolini, D., **Patuzzi, F.**, Baratieri, M., Horn, M.: Evaluation of the Transient Behaviour of a Fixed-Bed Biomass Gasifier for Demand-Oriented Electricity Production. In: 28th European Biomass Conference and Exhibition. pp. 464–476. ETA-Florence Renewable Energies (2020)
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66. Antolini, D., Brianti, B., Caligiuri, C., Borooah, R., **Patuzzi, F.**, Baratieri, M.: Energy Valorization of Forestry Residues through a Small-Scale Open Top Gasifier. In: 28th European Biomass Conference and Exhibition. pp. 407–410. ETA-Florence Renewable Energies (2020)
67. Paini, J., Benedetti, V., Baratieri, M., **Patuzzi, F.**: Apple Pomace Hydrothermal Carbonization for Downstream Valorization of Residues After Subcritical Water Extraction. In: 28th European Biomass Conference and Exhibition. pp. 611–615. ETA-Florence Renewable Energies (2020)
68. Borooah, R., Cordioli, E., Antolini, D., Basso, D., **Patuzzi, F.**, Baratieri, M.: Exploitability of woody forest residues for energy purposes through small scale gasification. In: 29th European Biomass Conference and Exhibition. pp. 458–462. ETA-Florence Renewable Energies (2021)
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70. **Patuzzi, F.**, Ciuta, S., Marias, F., Klinghoffer, N., Baratieri, M., Castaldi, M.J.: Investigating biomass pyrolysis through intra-particle gas measurements. In: Proceedings of 2021 IEEE International Workshop on Metrology for Agriculture and Forestry. pp. 427–431. IEEE, Trento & Bolzano, Italy (2021)
71. Menin, L., Asimakopoulos, K., Rasmussen, N.B.K., **Patuzzi, F.**, Baratieri, M., Gavala, H.N., Skiadas, I.: Competitiveness of

syngas biomethanation within the bioenergy with carbon capture and storage and power-to-gas concepts: Techno-economic modeling and evaluation of the level of incentives required at different scales. In: 29th European Biomass Conference and Exhibition. pp. 1–7. ETA-Florence Renewable Energies (2021)

72. Vakalis, S., Kyriakidis, K., **Patuzzi, F.**, Baratieri, M.: Ethanothermal and hydrothermal extraction of tar from char produced in commercial gasifiers and comparison with conventional tar extraction methods. In: 29th European Biomass Conference and Exhibition. pp. 1000–1003. ETA-Florence Renewable Energies (2021)
73. Paini, J., Benedetti, V., Baratieri, M., **Patuzzi, F.**: Integrated biorefinery of food processing byproducts: Subcritical water pretreatment of apple pomace coupled with hydrothermal carbonization and subsequent anaerobic digestion. In: 29th European Biomass Conference and Exhibition. pp. 911–913. ETA-Florence Renewable Energies (2021)
74. **Patuzzi, F.**, Ciuta, S., Marias, F., Klinghoffer, N., Baratieri, M., Castaldi, M.J.: Investigating biomass pyrolysis through intraparticle gas measurements. In: 2021 IEEE International Workshop on Metrology for Agriculture and Forestry (MetroAgriFor). pp. 427–431. IEEE, Trento & Bolzano, Italy (2021)
75. Piazzini, S., Antolini, D., Menin, L., Baratieri, M., **Patuzzi, F.**: Experimental Analysis of Producer Gas Upgrade Over a Char Bed Reactor for Enhanced Hydrogen Yield. In: 30th European Biomass Conference and Exhibition. pp. 790–793. ETA-Florence Renewable Energies (2022)
76. Caligiuri, C., Qureshi, M.Z., Renzi, M., Benedetti, V., **Patuzzi, F.**, Baratieri, M.: Wood packaging waste valorization: design of a producer gas combustion test-rig for fundamental flame studies. In: 31st European Biomass Conference and Exhibition. pp. 679–684. ETA-Florence Renewable Energies (2023)

**Publications
about the
applicant**

1. Biogas, lo sviluppo della memoria e il narcisismo dei manager: premiati i ricercatori di Unibz - altoadige.it, 20/10/2021, online at: <https://www.altoadige.it/cronaca/biogas-lo-sviluppo-della-memoria-e-il-narcisismo-dei-managerpremiati-i-ricercatori-di-unibz-1.3030749>
2. Forschungspreise 2021 der Stiftung Südtiroler Sparkasse an der unibz vergeben - suedtirolnews.it, 20/10/2021, online at: <https://www.suedtirolnews.it/wirtschaft/forschungspreise-2021-der-stiftung-suedtiroler-sparkasse-an-der-unibz-vergeben>
3. Premiati 3 giovani ricercatori universitari. Fondazione Sparkasse Il riconoscimento a Paola Rovelli, Milvia Cottini e Francesco Patuzzi. Alto Adige, 21/10/2021, pag. 25. Printed copies: 19 750
4. Nachwuchsforscher ausgezeichnet. WÜRDIGUNG: Forschungspreise 2021 der Stiftung Südtiroler Sparkasse an der Uni Bozen vergeben – Jeweils 5000 Euro für die 3 Preisträger. Dolomiten, 21/10/2021, pag. 15. Printed copies: 40 922
5. Separare la sabbia dalle alghe: un progetto bolzanino in Sardegna - Il Sole 24 Ore, 16/06/2022, online at:

<https://barbaraganz.blog.ilssole24ore.com/2022/06/16/separare-la-sabbia-dalle-alghe-un-progetto-bolzanino-in-sardegna/>

Awards

2017

- Award for the Best performance in Scientific production indexed in Scopus / Web of Science for the year 2017 in the research area "Energy Resources and Energy Efficiency" given by the The Dean and the Vice Deans of the Faculty of Science and Technology of the Free University of Bozen-Bolzano

2018

- Best Student Poster Award of the WasteEng2018 Conference, attributed to Daniele Antolini for the poster entitled: "Load modulation capability of an open top gasifier by varying the second stage air flow rate (284)"; co-authors: Daniele Antolini, Snehash Shivananda Ail, Carlo Caligiuri, Francesco Patuzzi, Massimiliano Renzi, Marco Baratieri; theme: Thermoconversion & Catalysis

2020

- Best Poster Award of the EUBCE2020 Conference, attributed to Clemens Hollenstein for the poster entitled: "Evaluation of the transient behaviour of a fixed-bed biomass gasifier for demand-oriented electricity production"; co-authors: Hollenstein C., Zemann C., Martini S., Gölles M., Felsberger W., Antolini D., Patuzzi F., Baratieri M., Horn M

2021

- Research Award 2021 from the Stiftung Südtiroler Sparkasse to the Free University of Bozen-Bolzano presented to Francesco Patuzzi, Faculty of Science and Technology. With this Research Award, the Free University of Bozen-Bolzano honours outstanding scientific achievements carried out in 2020

2023

- Best Student Presentation Award of the EUBCE2023 Conference, attributed to Pietro Postacchini for the presentation entitled: "Biomethane Production from the Co-digestion of Biomass-derived Syngas and Brewery Spent Yeast: Experimental Investigation of Mixed Microbial Cultures Adaptation and Continuous Co-digestion"; co-authors: Postacchini P., Menin L., Piazzì S., Patuzzi F., Baratieri M., Grimalt-Alemany A.

Further data

Oral presentations

November 2011: Oral presentation at the SuWaRest workshop, Free University of Bozen-Bolzano: "Use of reeds for energy production in Inner Mongolia: biomass-to-energy process scenarios"

June 2012: Oral presentation at 20th European Biomass Conference and Exhibition, Milan, Italy: "Characterization of the tar produced during pyrolysis of common reed: comparative study between on-line and off-line measuring method approaches"

September 2012: Oral presentation at 4th International Conference on Engineering for Waste and Biomass Valorisation, Porto, Portugal: "CHP gasification systems fed by torrefied biomass: assessment of the energy performance"

September 2012: Oral presentation at FaST2012-Research Day, Free University of Bozen-Bolzano: "Biomass Pyrolysis: advanced thermal

characterization and comparative study between online and off-line tar analysis"

February 2013: Oral presentation within the frame of the Joint Research Seminars series, Free University of Bozen-Bolzano: "Modelling and experimental characterisation of biomass thermal treatment: torrefaction and pyrolysis applied to wetland and grass biomasses"

June 2014: Oral presentation at 22nd European Biomass Conference and Exhibition, Hamburg, Germany: "Pyrolysis of a single wooden particle: a numerical model calibrated versus intraparticle gas sampling measurements"

August 2014: Flash Oral presentation at 5th International Conference on Engineering for Waste and Biomass Valorisation, Rio de Janeiro, Brazil: "Thermochemical and fluidynamic model of a wood particle subjected to pyrolysis supported by intraparticle gas sampling"

June 2015: Oral presentation at 23rd European Biomass Conference and Exhibition, Vienna, Austria: "Finite volumes numerical model for the assessment of intraparticle gas sampling during the pyrolysis of a single wooden particle"

May 2016: Oral presentation at 6th International Conference on Engineering for Waste and Biomass Valorisation, Albi, France: "Experiences in biomass gasification in South Tyrol: energy and environmental assessment"

October 2016: Oral presentation at 8th International Conference on Applied Energy, Beijing, China: "Gasification char as a potential substitute of activated carbon in adsorption applications"

October 2016: Oral presentation at 8th International Conference on Applied Energy, Beijing, China: "Experimental and modelling analysis of char decomposition: experiences with real scale gasification systems"

April 2017: Thematic lesson "Combustibili alternativi ed efficienza energetica" at IIS Galilei (Bolzano) and presentation of the Bachelor Program in Industrial and Mechanical Engineering offered by the Faculty of Science and Technology at the Free University of Bozen-Bolzano

May 2018: Presentation at the workshop "La gassificazione del legno", final event for the NEXT-GENERATION project, organized at the NOI Techpark of Bolzano: "Monitoraggio on-site degli impianti di gassificazione in Alto Adige: analisi delle prestazioni energetiche"

July 2018: Oral presentation at the at 7th International Conference on Engineering for Waste and Biomass Valorisation, Prague, Czech Republic: "Analysis and interpretation of intraparticle sampling data: assessment of the exothermicity effect during biomass pyrolysis"

May 2019: Oral presentation at 27th European Biomass Conference and Exhibition, Lisbon, Portugal: "Char recirculation for improving the conversion yields in fixed bed gasification systems"

January 2020: Oral presentation at 6th Central European Biomass Conference, Graz, Austria: "Char recirculation in fixed bed gasification systems: effects on conversion yields and process efficiency"

July 2020: short oral presentation at 28th European Biomass Conference and Exhibition, virtual edition: "Apple Pomace Hydrothermal Carbonization for Downstream Valorization of Residues After Subcritical Water Extraction"

- April 2021: short oral presentation at 29th European Biomass Conference and Exhibition, virtual edition (EUBCE2021): "Gasification adiabatic temperature concept for modelling a fixed bed biomass gasifier"
- June 2021: Oral presentation at the at 8th International Conference on Engineering for Waste and Biomass Valorisation, virtual edition (WasteEng2020): "Char recirculation as a strategy for higher conversion yields in fixed bed biomass gasification systems"
- June 2021: Oral presentation at the at 8th International Conference on Sustainable Solid Waste Management, virtual edition (Thessaloniki2021): "Effect of char recirculation in fixed bed gasifiers: experimental and modelling analysis"
- June 2021: Oral presentation at the at 8th International Conference on Sustainable Solid Waste Management, virtual edition (Thessaloniki2021): "Fuel flexibility of an open top pilot plant gasifier"
- October 2021: Oral presentation at the Sparkasse Academy after the conferral of the Research Award 2021 from the Stiftung Südtiroler Sparkasse in front of the Sparkasse steering body: "Stato dell'arte dei sistemi di gassificazione di biomassa di piccola scala: risultati da un'estensiva campagna di monitoraggio"
- November 2021: Oral presentation at the 2021 IEEE International Workshop on Metrology for Agriculture and Forestry (MetroAgriFor): "Investigating biomass pyrolysis through intra-particle gas measurements"
- January 2023: Oral presentation at the 7th Central European Biomass Conference, Graz, Austria (CEBC2023): "Upgrading of producer gas from small scale biomass air gasification: hydrogen yield enhancement over a char bed reactor"
- January 2023: Oral presentation at the 7th Central European Biomass Conference, Graz, Austria (CEBC2023): "Biochar and its properties as a component in composite materials"

Invited speaker

- September 2015: Invited speaker at the Open-day sulla gassificazione, University of Modena and Reggio Emilia, Tecnopolo di Modena; title of the oral presentation: "Analisi degli impianti di gassificazione di piccola taglia in Alto Adige"
- October 2018: Invited speaker at SKT 2018 conference, 7th Coupling Days on Thermal Analysis Coupled to Evolved Gas Analysis; title of the oral presentation: "Thermogravimetric analysis coupled with FT-IR spectroscopy: advanced thermal analysis applied to the characterization of common reed pyrolysis".
- January 2019: Invited speaker at the "EU-Japan small-scale biomass gasification seminar" hosted by the 14th Conference on Biomass Science in Higashihiroshima; title of the oral presentations: "Valorization of co-products of small-scale gasification plants (biochar and bio-oil) and importance for overall profitability of the plant".
- January 2019: Invited speaker at the "EU-Japan small-scale biomass gasification seminar" hosted by the 14th Conference on Biomass Science in Higashihiroshima; title of the oral presentation: "Case study of South Tyrol (Italy) – results of environmental and performance monitoring of gasification plants".

May 2021: Invited lecture within the course on "Waste-to-Energy Technologies" held by Dr. Stergios Vakalis at the University of the Aegean. Title of the lecture: "Next challenges for biomass gasification: fuel flexibility, load modulation, char valorization"

May 2022: Invited speaker at the technical fair "Progetto Fuoco" in Verona. Title of the presentation: "Nuove sfide per il settore della gassificazione: biomasse residuali e biochar di qualità"

February 2024: Invited speaker at the technical fair "Progetto Fuoco" in Verona. Title of the presentation: "Produzione di Biochar tramite pirolisi e gassificazione di biomasse di scarto: risultati del progetto Alps4GreenC"

**Language
competences**

Italian: first language

English: very good reading, writing and verbal skills (CAE C1 certificate achieved in December 2012, internal unibz C1 certificate achieved in June 2018)

German: intermediate knowledge (B1 Goethe certificate achieved in July 2020, bilingual certificate level B1 issued by the Autonomous Province of Bolzano in January 2021)

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 21/03/2024

Signature
(digitally signed)