CURRICULUM VITAE Marco Baratieri

Personal Information

Name and surname Marco Baratieri
Date of Birth 28 July 1975
Address (office) piazza Università 5 (office K0.03), Bolzano

Contacts

ph. +39 0471 017201
email marco.baratieri@unibz.it

Academic position

2019 – date Full Professor of Thermal Engineering and Industrial Energy Systems (ING-IND/10)
Faculty of Science and Technology, Free University of Bozen-Bolzano

Past academic positions

2015 – 2019 Associate Prof. of Thermal Engineering and Industrial Energy Systems, ING-IND/10
Faculty of Science and Technology, Free University of Bozen-Bolzano

2009 – 2014 Assistant Prof. of Environmental Building Physics, ING-IND/11
Faculty of Science and Technology, Free University of Bozen-Bolzano

2007 – 2009 Postdoctoral fellow
Department of Civil and Environmental Engineering - University of Trento

Education PhD in Environmental Engineering at the University of Trento
MSc in Environmental Engineering (5 year program) at the University of Trento

RESEARCH ACTIVITIES

-- *1. Energy valorization of biomass and wastes*

1.1) Theoretical and experimental analysis of gasification and pyrolysis processes applied to biomass and wastes: development of methods for understanding conversion mechanisms and fuel properties.
1.2) Theoretical and experimental study of solid biomass CHP systems: development of optimization methods for pilot e pre-commercial systems.
1.3) Analysis of the potential valorization of gasification solid byproducts (char): theoretical and experimental analysis for the development of innovative materials and filtering mediums for industries and agriculture.
1.4) Development of catalysts on residual char as support for the production of third-generation biofuels and for tar cracking applications in gasification syngas clean-up.
1.5) Theoretical and experimental study of hydrothermal carbonization (HTC) of moist biomass.

-- *2. Energy efficiency in buildings and industrial processes*

2.1) Energy efficiency in buildings: assessment of energy performance of opaque building components in steady-state and dynamic conditions.
2.2) Energy efficiency in energy plants: assessment of efficiency in domestic biomass systems in operation.
2.3) Energy efficiency in industrial processes: analysis of potential energy recovery in distribution and final uses.

BIBLIOMETRIC INDEXES (Scopus, May 2020)

SCOPUS: Documents: 106 / Citations: 1298 / h-index: 19
Google Scholar: Citations: 1814 / h-index: 21 / i-10 index: 41

SCIENTIFIC COMMITTEE PARTICIPATIONS

• Member of the scientific committee of the European Biomass Conference and Exhibition (EUBCE).
• Member of the scientific committee of the International Conference on Engineering for Biomass and Waste Valorisation (WasteEng).
• Member of the scientific committee of the Central European Biomass Conference, Graz.
• Member of the scientific committee of the International Conference on Sustainable Solid Waste Management.

EDITORSHIPS AND MEMBERSHIPS IN ACADEMIC ORGANIZATIONS

• Member of the editorial board of Biomass & Bioenergy International Journal
• Member of the editorial board of the International Journal of Oil, Gas and Coal Technology (IJOGCT) (2012-2017).
• Founder member of the International Building Performance Simulation Association, Chapter Italy.
• Member of the FTI, Associazione Nazionale della Fisica Tecnica Italiana

ORGANIZATION OF CONFERENCES

• EU-Japan small-scale biomass gasification seminar, with the Japan Institute of Energy and ETA-Florence, Higashihiroshima, Giappone (16/01/2019)
• EU-Japan biomass seminar “Sustainable value chains for distributed bioenergy projects”, with the Japan Institute of Energy and ETA-Florence, 27 maggio 2019 Lisbona, Portogallo (27/04/2019)
• Member of the Organizing Committee of the 4th IBPSA Italy conference Building Simulation Applications (BSA2019), Bolzano (19-21 giugno 2019)
• Chairman and promoter of “µCHP16 - micro cogeneration through biomass gasification (µCHP 16)” conference, Bolzano (2-3 dicembre 2016)
• Member of the Organizing Committee of the XLIII Annual Meeting of the European Society for New Methods in Agricultural Research (ESNA2014), Bolzano (September 3rd – 6th 2014)
• Member of the Organizing Committee of the first IBPSA Italy conference Building Simulation Applications (BSA2017), Bolzano (January 30th - February 1st 2013)
• Member of the Organizing Committee of the second IBPSA Italy conference Building Simulation Applications (BSA2015), Bolzano (February 4th – 6th 2015)
• Member of the Organizing Committee of the first IBPSA Italy conference Building Simulation Applications (BSA2013) which took place in Bolzano (January 30th - February 1st 2013)

REVIEWER ACTIVITIES

• Reviewer for international journals: Applied Energy, Applied Pyrolysis, Applied Thermal Engineering, Fuel, Energy Conversion and Management, Journal of Hydrogen Energy, Fuel Processing Technology, Applied Biochemistry and Biotechnology, Bioresource Technology, Environmental Technology.

RESEARCH GRANTS

[As scientific coordinator]

• "BIO-CHEAPER - BIOmasses Circular Holistic Economy APproach to EneRgy equipments" PRIN - Bando 2017, finanziato dal Ministero dell'Istruzione dell'Università e della Ricerca; period: 2019-ongoing
• "HB-PONICS: Hydrothermal carbonization of Biogas digestate for hydroPonics: an innovative concept of bio-refinery" funded by European Regional Development Fund (ERDF) 2014-2020, period: 2017-ongoing
• "COOL-CAR: Thermal management of the accumulator batteries in electric and hybrid cars: optimization strategies for performance enhancing and for a sustainable mobility" funded by European Regional Development Fund (ERDF) 2014-2020, period: 2017-ongoing
• "FlexiFuelGasControl, Increased fuel flexibility and modulation capability of fixed-bed biomass gasifiers by means of model based control" finanziato da Österreichischen Forschungsförderungsgesellschaft mbH (FFG), (Coordinator of the Italian unit) period: 2017-ongoing

• "NEXT GENERATION – Novel EXTension of biomass poly-GENERATION to small scale gasification systems in South-Tyrol", funded by: Provincia Autonoma di Bolzano (L.P., 13.12.2006, N. 14), period: 2016-ongoing
• "WOOD-UP: Valorizzazione della filiera di gassificazione di biomasse legnose per l'energia, la fertilità del suolo e la mitigazione dei cambiamenti climatici" funded by European Regional Development Fund (ERDF) 2014-2020, (co-investigator), period: 2016-ongoing
• "LTFD: Laboratori di Termo Fluido Dinamica Applicata, infrastrutture di ricerca applicata per aziende e industria altoatesina" funded by European Regional Development Fund (ERDF) 2014-2020, (co-investigator), period: 2016-ongoing
• "BIO2LIQ – BIOmass-to-LIQuid as a strategy to enhance gasification potential in a biorefinery perspective", funded by: CRC-UNIBZ, period: 2016-ongoing
• "Experiences in biomass GAsification in South -Tyrol: energy and environmental assessment (GAST)", funded by: Provincia Autonoma di Bolzano (L.P., 13.12.2006, N. 14), period: 2012-2014
• "Sustainable use of biomass in South Tyrol: from production to technology", funded by: Provincia Autonoma di Bolzano (L.P., 13.12.2006, N. 14), period: 2011-2014
• "Bench scale pyrolysis and torrefaction of lignocellulosic Biomass: process characterization, byproducts analysis and transformation", funded by: CRC-UNIBZ, period: 2011-2013
• "Dynamic performances of envelope structures in buildings: design of a control system", funded by: UNIBZ, period: 2010-2013

[As WP´s responsible]
• "EN-LAN Sustainable Chain for the use of Biomass in South Tyrol" finanziato tramite European Regional Development Fund (ERDF) 2007-2013
• "Sustainable water management and wetland restoration in settlements of continental-arid Central Asia (SuWaRest)", funded by: Stifterverband für die Deutsche Wissenschaft (Germany), period: 2010-2013
• "Sustainable chain for the use of biomass in South-Tyrol", funded by: UNIBZ, period: 2009-2011

[As investigator]
• "Timber building with enhanced energy and structural performance (TimBeeSt)", funded by: Provincia Autonoma di Bolzano (L.P., 13.12.2006, N. 14), period: 2012-2014
• "ENvelope-LAbs Network dell'Alto Adige per la valutazione prestazionale dell'involucro edilizio (EN-LAN)", funded by: Provincia Autonoma di Bolzano (FESR 2007-2013), period: 2012-2015
• "Development of simplified sensors for continuous monitoring of energy and environmental performances of tractors by a local telemetry network", funded by: UNIBZ, period: 2011-2013
• "Modelling and designing solar barn dryers for forages according to modular approaches (ForSOLARdrying)", funded by: UNIBZ, period: 2011-2014
• "EuroChar—Biochar for Carbon sequestration and large-scale removal of greenhouse gases (GHG) from the atmosphere", fund FP7-ENV-2010, period: 2011-2013
• "Air-to-air heat recovery in HVAC systems", funded by: UNIBZ, period: 2011-2013
"Build4Future - Building the Future: Innovative Pathways for Construction Industry", funded by: UNIBZ, period: 2009-2011
• "Sustainable COastal Land Management: Trade-offs in EcoSystem Services (COMTESS)", funded by: Stifterverband für die Deutsche Wissenschaft (Germany), period: 2010-2015

INVITED TALKS
[Keynote Lecture] "Perspectives on the evolution of gasification: from CHP to integrated poly-generative technology", at Heraklion 2019, 7th International Conference on Sustainable Solid Waste Management, Heraklion, 26–29 giugno 2019
[Invited talk] "Technology overview: main small-scale gasification technologies, point of strength and critical issues", at EU-Japan small-scale biomass gasification seminar, Higashihiroshima, Giappone (16/01/2019)

[Invited talk] "From biomass CHP to poly-generative systems: perspectives for gasification", at EU-Japan biomass seminar "Sustainable value chains for distributed bioenergy projects", Lisbona, Portogallo (27/04/2019)
[Invited talk] "A Case Study of Gasification CHP in Northern Italy in the European Context and Comparison to Traditional Combustion Systems", at the EEC/WTERT 2018 Bi-annual Meeting, at The Earth Engineering Center at City College (EEC|CCNY), 4-5 ottobre 2018
[Invited talk] "Extensive monitoring of small-scale biomass gasification systems in South-Tyrol (Italy): experiences and lessons learned in the last 5 years", at the Gas Analysis Workshop 2018, DTU - Copenhagen, 18 maggio 2018

TEACHING AND SUPERVISION

Course of "Power Production, CHP and District Heating System", at the Master Level
Courses of "Engineering Thermodynamics and Heat Transfer", "Energetics", "Fundamentals of Energetics", "Energy Systems", "Renewable Energy", at the Bachelor Level
Last 5 years: Supervisor of 2 RTDs and 6 Post-Doc Fellows, Supervisor of 15 PhD students, Co-supervisor of 10 PhD students

EXTERNAL AND INTERNAL APPOINTMENTS

• Representative to the COMET K1 Competence Centre (Austria); Leading partners: TU-Wien, Bioenergy2020 (Wieselburg, Austria)
• Responsible of the "Energy Resources and Energy Efficiency" Research Area at UNIBZ
• Director of the Study Council of the Master in Energy Engineering, LM-30, joint program of the Free University of Bolzano and of the University of Trento (from A.A. 2017/18)
• Director of the Study Council of the Bachelor in Wood Engineering, L-9 (from A.A. 2018/19)
• Director of the Research Area "Energy Resources and Energy Efficiency" of the Free University of Bolzano (from 2014)
• Responsible of the "Bioenergy and Biofuels Laboratory" at UNIBZ
• Member of the Committee of the PhD Program in "Sustainable Energy and Technology"
• Member of the Scientific and Didactic Council of the Executive Master "Klimahaus"
• Member of the Faculty Council (since A.Y. 2009-10)

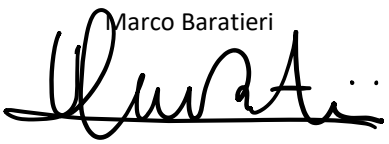
AWARDS

• Student Award (Awarded to Elisa Carlon, PhD student); "Long-Term Monitoring of Pellet Boilers Installed in Residential Buildings: Efficiency and Operational Behaviour" alla conferenza "23rd European Biomass Conference and Exhibition" - Vienna (Austria), June 1-4, 2015
• Best poster Award (Awarded to Daniele Antolini, PhD student); "Load modulation capability of an open top gasifier by varying the second stage air flow rate", WasteEng18 - 7th International Conference on Engineering for Waste and Biomass Valorisation, July 2-5, 2018, Prague, Czech Republic

In compliance with the Italian legislative Decree no. 196 dated 30/06/2003, I hereby authorize you to use and process my personal details contained in this document.

Bozen-Bolzano, 3rd July 2020

Marco Baratieri



Francesco Patuzzi – Academic Curriculum Vitae

Personal information

Francesco Patuzzi
Place and – date of birth: Soave (VR) – 22.01.1984
Nationality: Italian
E-Mail: francesco.patuzzi@unibz.it

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

- Researcher on a fixed-term contract (RTDb, ex art. 24 L. 240/2010), disciplinary sector ING-IND/10 (Thermal engineering and industrial energy systems)
- Start of appointment: 01.10.2019
- Employer: Free University of Bozen-Bolzano, Faculty of Science and Technology
- 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.

Professional experience

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 reseach:
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 analyisis (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

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 – currently running
- Supervisor of the Ph.D. thesis: "Strategies for the integration of food and energy value chains", Candidate: Jacopo Paini,

Ph.D. in Food Engineering and Biotechnology

- Co-supervisor of the Master Thesis: "Recirculation of woodchar in a downdraft open top gasifier: cogasification strategies and optimization", candidate: Giacomo Bonzi, Master in Energy Engineering
- Co-supervisor of the Master Thesis: "Valorisation of residues from parapharmaceutical and herbal medicine production: a case study", candidate: Alessandro Cascioli, Master in Energy Engineering
- Co-supervisor of the Master Thesis: "Energy valorization of wood residues through a small scale open top gasifier", candidate: Boris Brianti, Master in Energy Engineering
- Academic tutor for the internship of Anil Balikci, Master in Industrial and Mechanical Engineering

2018 – currently running

- Co-supervisor of the Ph.D. thesis: "Synergies between Biological and Thermal Treatments for Bioenergy Production: Towards the Bio-refinery Concept", Candidate: Matteo Pecchi, Ph.D. in Sustainable Energy and Technology
- Co-supervisor of the Ph.D. thesis: "Design and operation of biomass to biofuels systems", Candidate: Stefano Piazzi, Ph.D. in Sustainable Energy and Technology

2018 – currently running

- Academic tutor within the Study Program in Wood Engineering L-9 prof

2017 – currently running

- Co-supervisor of the Ph.D. thesis: "Valorization of biomass char through use in adsorption and catalytic applications", Candidate: Eleonora Cordioli, Ph.D. in Sustainable Energy and Technology
- Co-supervisor of the Ph.D. thesis: "Enhanced fuel flexibility and load modulation capability of biomass gasification systems", Candidate: Daniele Antolini, Ph.D. in Sustainable Energy and Technology

2017 – currently running

- Academic tutor within the Master in Industrial Mechanical Engineering LM-33

2016 – 2019

- Co-supervisor of the Ph.D. thesis: "Biomass-to-liquid as a strategy to enhance gasification potential in a biorefinery perspective", Candidate: Vittoria Benedetti, Ph.D. in Sustainable Energy and Technology

2016 – 2017

- Co-supervision of the Master Thesis: "Assessment of gasification char potential as energy source in South-Tyrol", candidate: Stefano Piazzi, Master in Energy Engineering

2015 – 2018

- Co-supervisor of the Ph.D. thesis: "Char based catalysts development and application assessment for different purposes", Candidate: Junaid Faridi Ahmad, Ph.D. in Sustainable Energy and Technology

2013 – 2016

- Co-supervisor of the Ph.D. thesis: "Small scale biomass gasification for energy production", Candidate: Stergios Vakalis, Ph.D. in Sustainable Energy and Technology

2015 – 2016

- Co-supervisor of the Bachelor thesis: "Valorizzazione energetica di biomasse palustri in Alto Adige", Candidate: Matteo Martinelli, Bachelor in Logistic and Production Engineering
- Co-supervisor of the Master thesis: "Experimental and modelling analysis of char decomposition for potential use as a catalytic gas filtering medium", Candidate: Eleonora Cordioli, Master in Energy Engineering
- Co-supervisor of the Master thesis: "Fuel flexibility for biomass boilers: analysis of the potential of some alternative feedstock in Italy", Candidate: Stefano Prandi, Master in Energy Engineering
- Co-supervisor of the Master thesis: "Analysis of a flat solar air collector system for drying applications in agriculture", Candidate: Nicola Degasperi, Master in Energy Engineering

2014 – 2015

- Academic tutor for the internship of Bernardi Alessandro, Master 2nd level "Building Energy Performance. Design, Optimization and Service - CasaClima"
- Co-supervisor of the Master thesis: "Thermal model of a wind turbine tower", Candidate: Mattia Del Favero, Master in Energy Engineering

2012 – 2013

- Co-supervisor of the Bachelor thesis: "Hydrogen and IC engines: exploitation in CHP systems", Candidate: Andreas Ebner, Bachelor in Industrial and Mechanical Engineering

Other academic responsibilities

Institutional activities

- 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)
- Member of the Study Council of the Study Program in "Wood Engineering" (since A.Y. 2018-19)
- Member of the Selection Committee for the International PhD in Food Engineering and Biotechnology (XXXIV cycle)
- Member of the Selection Committee of the following procedures for teaching contract lecturers:
  2017
  - ST-MEE 6 Engineering Thermodynamics Heat and Mass Transfer (LM-30)

  2018
  - ST-2 Engineering Thermodynamics Heat and Mass Transfer (LM-30)
  - ST-44 Product Design (L-9 prof)
  - ST-49 Wood Chemistry (L-9 prof)

  2019
  - ST-25 - Holzchemie (L-9 prof)
  - ST-26 - Product Design (L-9 prof)

- ST-27 - Technical Drawing - CAD (L-9 prof)
- ST-28 - Heat and mass transfer (L-9 prof)
- ST-29 - Energy efficiency in wood production and final use (L-9 prof)
- ST-30 - Mechatronics and Process Automation (L-9 prof)
- ST-31 - Manufacturing Technology (L-9 prof)
- ST-32 - Sicurezza e valutazione LCA (L-9 prof)
- ST-33 - Cantiere 4.0 (L-9 prof)
- ST-34 - High-Performance Buildings: Comfort, Energy Efficiency (L-9 prof)
- ST-35 - Strukturmechanik (L-9 prof)
- ST-36 - Hochleistungs-Gebäude: Erdbebensicherung und Brandschutz (L-9 prof)
- ST-38 - Solarenergiesysteme (LM-30)
- ST-47 - Material sciences (L-9 prof)
- ST-59 - Material sciences (L-9 prof)

Participation to scientific committees of conferences

- Member of the Students Tutoring Scientific Committee in the frame of the international conference Building Simulation Applications - BSA 2017 which will be held at the Free University of Bozen-Bolzano from February 8th to 10th 2017.

Participation to organizing committees of conferences

- 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 which will be 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 µCHP 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

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

Reviewer for international scientific journals
- Biomass & Bioenergy
- Waste and Biomass Valorization
- Energy Conversion and Management
- Energy
- Waste Management

Reviewer for international project proposals
- FONDECYT Regular 2017 grant competition (Chilean National Science and Technology Commission, CONICYT - Chile).

Activities as recognized external expert
- Incarico di supporto al RUP, Responsabile Unico del Procedimento, per verifica su impianto di biogassificazione per conto di ICE - Agenzia per la promozione all'estero e l'internazionalizzazione delle imprese italiane, Ufficio Tecnologia Industriale Energia e Ambiente, relativamente al progetto dimostrativo AGROGAS

Third mission
- 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).

Qualification

Memberships

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

- 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 reseach: 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 analyisis (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 (Wuliangsuhai 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 Wuliangsuhai 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 Wuliangsuhai 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**
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 - today	FUB internal funding, (ZeFo)	THErmo-fluid DYnamics of Solid fuels Conversion systems: Optimization strategies (THE_DYSCO)
2016 – today	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 - today	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 – today	Provincia Autonoma di Bolzano	Sviluppo della ricerca tecnologica: Convenzione programmati-cofinanziaria 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**
2019 - today	Third party contract (Palazzetti spa)	GAsification for improved combustion in a biomass STOVE (GASTOVE), PI: Marco Baratieri, co-PI: Francesco Patuzzi
2019 – today	Italian Ministry of Education, University and	BIOmasses Circular Holistic Economy APproach to EneRgy equipments (BIO-CHEAPER), PI: Marco Baratieri, co-PI: Francesco Patuzzi

	Research (PRIN 2017)	
2018 – today	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

Bibliometrics indexes (08/01/2020)

Google Scholar	95 papers	587 citations	H-index=13
Scopus	59 papers	439 citations	H-index=12
ISI Web of Science	48 papers	365 citations	H-index=10

Publications

Books – Edited

1. Baratieri M., Corrado V., Gasparella A., **Patuzzi F.** (edited by), Building Simulation Applications BSA 2013. 1st IBPSA Italy conference, Bozen-Bolzano, 30th January-1st February 2013, 418 pages, University Press, Bolzano, 2013, ISBN:978-88-6046-058-5
2. Baratieri M., Corrado V., Gasparella A., **Patuzzi F.** (edited by), Building Simulation Applications BSA 2015. 2nd IBPSA Italy conference, Bozen-Bolzano, 4th-6th February 2015, 418 pages, University Press, Bolzano, 2015, ISBN: 978-88-6046-074-5
3. Pernigotto G., **Patuzzi F.**, Prada A., Corrado V., Gasparella A., (edited by), Building Simulation Applications BSA 2017. 3rd IBPSA Italy conference, Bozen-Bolzano, 8th-10th February 2017, 590 pages, University Press, Bolzano, 2018, ISBN: 978-88-6046-136-0
4. Castaldi, M.J., **Patuzzi, F.**, Ciuta, S., Tupsakhare, S., Tsiamis, D. (edited by), Proceedings of 2018 EEC/WTERT Conference. ASME, New York (2019), ISBN: 9780791861950, doi: 10.1115/1.861950

Chapters in books

1. Baratieri, M., **Patuzzi, F.**: Reeds as a renewable energy source: Insight into possible conversion pathways. In: Cirella, G.T. and Zerbe, S. (eds.) Sustainable water management and wetland restoration strategies in northern China. pp. 95–117. University Press, Bolzano, 2014, ISBN: 978-88-6046-069-1
2. Köbbing, J.F., Thevs, N., **Patuzzi, F.**, Baratieri, M.: Livelihood

and economy of reed wetlands. In: Cirella, G.T. and Zerbe, S. (eds.) Sustainable water management and wetland restoration strategies in northern China. pp. 119–135. University Press, Bolzano, 2014, ISBN: 978-88-6046-069-1

3. Baratieri, M., **Patuzzi, F.**: Laboratory/Demonstration-Scale Developments. In: Ciuta, S., Tsiamis, D., and Castaldi, M.J. (eds.) Gasification of Waste Materials. pp. 37–64. Elsevier (2018), DOI: 10.1016/B978-0-12-812716-2.00003-0

Journal Papers in refereed academic journals

1. **Patuzzi, F.**, Mimmo, T., Cesco, S., Gasparella, A., Baratieri, M.: Common reeds (*Phragmites australis*) as sustainable energy source: experimental and modelling analysis of torrefaction and pyrolysis processes. GCB Bioenergy. 5, 367–374 (2013)
DOI:10.1111/gcbb.12000
Scopus citations: 11
Journal Impact Factor: 6.151 (2016)

2. **Patuzzi, F.**, Roveda, D., Mimmo, T., Karl, J., Baratieri, M.: A comparison between on-line and off-line tar analysis methods applied to common reed pyrolysis. Fuel. 111, 689–695 (2013)
DOI:10.1016/j.fuel.2013.03.054
Scopus citations: 12
Journal Impact Factor: 3.611 (2016)

3. **Patuzzi, F.**, Gasparella, A., Baratieri, M.: Thermochemical and Fluid Dynamic Model of a Bench-Scale Torrefaction Reactor. Waste and Biomass Valorization. 5, 165–173 (2014)
DOI: 10.1007/s12649-013-9236-9
Scopus citations: 5
Journal Impact Factor: 1.056 (2014)

4. Prando, D., **Patuzzi, F.**, Baggio, P., Baratieri, M.: CHP Gasification Systems Fed by Torrefied Biomass: Assessment of the Energy Performance. Waste and Biomass Valorization. 5, 147– 155 (2014)
DOI: 10.1007/s12649-013-9227-x
Scopus citations: 2
Journal Impact Factor: 1.056 (2014)

5. Ciuta, S., **Patuzzi, F.**, Baratieri, M., Castaldi, M.J.: Biomass energy behavior study during pyrolysis process by intraparticle gas sampling. Journal of Analytical and Applied Pyrolysis. 108, 316–322 (2014)
DOI: 10.1016/j.jaap.2014.04.012
Scopus citations: 18
Journal Impact Factor: 3.652 (2016)

6. Prando, D., **Patuzzi, F.**, Pernigotto, G., Gasparella, A., Baratieri, M.: Biomass gasification systems for residential application: an integrated simulation approach. Applied Thermal Engineering. 71, 152–160 (2014)
DOI: 10.1016/j.applthermaleng.2014.06.043
Scopus citations: 30
Journal Impact Factor: 3.044 (2016)

7. Köbbing, J.F., **Patuzzi, F.**, Baratieri, M., Beckmann, V., Thevs, N., Zerbe, S.: Economic evaluation of Common Reed potential for energy production: a case study in Wuliangsuhai Lake (Inner Mongolia, China). Biomass & Bioenergy. (2014)

DOI: 10.1016/j.biombioe.2014.08.002
Scopus citations: 13
Journal Impact Factor: 3.394 (2014)

8. Baratieri, M., Basso, D., **Patuzzi, F.**, Castello, D., Fiori, L.: Kinetic and Thermal Modeling of Hydrothermal Carbonization Applied to Grape Marc. Chemical Engineering Transactions. 43, 505–510 (2015)
DOI: 10.3303/cet1543085
Scopus citations: 8

9. Basso, D., Weiss-Hortala, E., **Patuzzi, F.**, Castello, D., Baratieri, M., Fiori, L.: Hydrothermal carbonization of off-specification compost: A byproduct of the organic municipal solid waste treatment. Bioresource Technology. 182, 217–224 (2015)
DOI: 10.1016/j.biortech.2015.01.118
Scopus citations: 49
Journal Impact Factor: 4.917 (2016)

10. **Patuzzi, F.**, Ciuta, S., Castaldi, M.J., Baratieri, M.: Intraparticle gas sampling during wood particle pyrolysis: methodology assessment by means of thermofluidynamic modeling. Journal of Analytical and Applied Pyrolysis. 113, 638–645 (2015)
DOI: 10.1016/j.jaap.2015.04.015
Scopus citations: 2
Journal Impact Factor: 3.652 (2016)

11. Basso, D., **Patuzzi, F.**, Castello, D., Baratieri, M., Rada, E.C., Weiss-Hortala, E., Fiori, L.: Agro-industrial waste to solid biofuel through hydrothermal carbonization. Waste Management. 47, 114–121 (2016)
DOI: 10.1016/j.wasman.2015.05.013
Scopus citations: 79
Journal Impact Factor: 3.829 (2016)

12. Vakalis, S., **Patuzzi, F.**, Baratieri, M.: Thermodynamic modeling of small scale biomass gasifiers: Development and assessment of the "'Multi-Box'" approach, Bioresource Technology. 206, 173–179 (2016).
DOI: 10.1016/j.biortech.2016.01.060
Scopus citations: 11
Journal Impact Factor: 4.917 (2016)

13. **Patuzzi, F.**, Prando, D., Vakalis, S., Rizzo, A.M., Chiaramonti, D., Tirler, W., Mimmo, T., Gasparella, A., Baratieri, M.: Small-scale biomass gasification CHP systems: comparative performance assessment and monitoring experiences in South Tyrol (Italy). Energy. 112, 285–293 (2016)
DOI: 10.1016/j.energy.2016.06.077
Scopus citations: 39
Journal Impact Factor: 4.292 (2016)

14. Vakalis, S., **Patuzzi, F.**, Baratieri, M.: Introduction of an energy efficiency tool for small scale biomass gasifiers - a thermodynamic approach. Energy Conversion and Management. 113, 1–9 (2017)
DOI: 10.1016/j.enconman.2016.11.022
Scopus citations: 11
Journal Impact Factor: 4.801 (2016)

15. Renzi, M., **Patuzzi, F.**, Baratieri, M.: Syngas feed of micro gas turbines with steam injection: Effects on performance, combustion and pollutants formation. Applied Energy. 206, 697–707 (2017).
    DOI: 10.1016/j.apenergy.2017.08.214
    Scopus citations: 8
    Journal Impact Factor: 7.182 (2017)

16. Benedetti, V., **Patuzzi, F.**, Baratieri, M.: Characterization of char from biomass gasification and its similarities with activated carbon in adsorption applications. Applied Energy. 227, 92–99 (2018)
    DOI: 10.1016/j.apenergy.2017.08.076
    Scopus citations: 25
    Journal Impact Factor: 7.900 (2018)

17. Vakalis, S., **Patuzzi, F.**, Moustakas, K., Sotiropoulos, A., Malamis, D., Baratieri, M.: Analysis of tar compounds and quantification of naphthalene from thermal treatment of household biowaste. Journal of Environmental Management. 216, 153–159 (2018).
    DOI: 10.1016/j.jenvman.2017.04.063
    Scopus citations: 2
    Journal Impact Factor: 3.131 (2017)

18. Ahmad, J., Rashid, U., **Patuzzi, F.**, Baratieri, M., Taufiq-Yap, Y.H.: Synthesis of char-based acidic catalyst for methanolysis of waste cooking oil: An insight into a possible valorization pathway for the solid by-product of gasification. Energy Conversion and Management. 158, 186–192 (2018).
    DOI: 10.1016/j.enconman.2017.12.059
    Scopus citations: 10
    Journal Impact Factor: 4.801 (2016)

19. Basso, D., Weiss-Hortala, E., **Patuzzi, F.**, Baratieri, M., Fiori, L.: In Deep Analysis on the Behavior of Grape Marc Constituents during Hydrothermal Carbonization. Energies. 11, 1379 (2018).
    DOI: 10.3390/en11061379
    Scopus citations: 3
    Journal Impact Factor: 2.676 (2018)

20. Ciuta, S., **Patuzzi, F.**, Baratieri, M., Castaldi, M.J.: Enthalpy changes during pyrolysis of biomass: Interpretation of intraparticle gas sampling. Applied Energy. 228, 1985–1993 (2018)
    DOI: 10.1016/j.apenergy.2018.07.061
    Scopus citations: 2
    Journal Impact Factor: 7.900(2018)

21. Vakalis, S., Heimann, R., Ahmad, J., **Patuzzi, F.**, Baratieri, M.: The case of Frictional Torrefaction and the effect of reflux condensation on the operation of the Rotary Compression Unit. Bioresource Technology. 268, 91–96 (2018).
    Doi:10.1016/j.biortech.2018.07.140
    Scopus citations: 3
    Journal Impact Factor: 5.807(2018)

22. Marchelli, F., Cordioli, E., **Patuzzi, F.**, Sisani, E., Barelli, L., Baratieri, M., Arato, E., Bosio, B.: Experimental study on H2S adsorption on gasification char under different operative

conditions. Biomass and Bioenergy. 126, 106–116 (2019). Doi:10.1016/j.biombioe.2019.05.003
Scopus citations: 1
Journal Impact Factor: 3.537(2018)

23. Vakalis, S., Moustakas, K., Benedetti, V., Cordioli, E., **Patuzzi, F.**, Loizidou, M., Baratieri, M.: The "COFFEE BIN" concept: centralized collection and torrefaction of spent coffee grounds. Environmental Science and Pollution Research. (2019). Doi:10.1007/s11356-019-04919-3
Journal Impact Factor: 2.914(2018)

24. Benedetti, V., Ail, S.S., **Patuzzi, F.**, Baratieri, M.: Valorization of char from biomass gasification as catalyst support in Dry Reforming of Methane. Frontiers in Chemistry. 7, 1–12 (2019). Doi:10.3389/fchem.2019.00119
Scopus citations: 2
Journal Impact Factor: 3.782(2018)

25. Antolini, D., Ail, S.S., **Patuzzi, F.**, Grigiante, M., Baratieri, M.: Experimental investigations of air-CO2 biomass gasification in reversed downdraft gasifier. Fuel. 253, 1473–1481 (2019). Doi:10.1016/j.fuel.2019.05.116
Journal Impact Factor: 5.128(2018)

26. Benedetti, V., Cordioli, E., **Patuzzi, F.**, Baratieri, M.: CO2 Adsorption study on pure and chemically activated chars derived from commercial biomass gasifiers. Journal of CO2 Utilization. 33, 46–54 (2019).
Doi:10.1016/j.jcou.2019.05.008
Journal Impact Factor: 5.189 (2018)

27. Cordioli, E., **Patuzzi, F.**, Baratieri, M.: Thermal and catalytic cracking of toluene using char from commercial gasification systems. Energies. 12, 3764 (2019).
Doi: 10.3390/en12193764.
Journal Impact Factor: 2.707 (2018)

28. Antolini, D., Hollenstein, C., Martini, S., **Patuzzi, F.**, Zemann, C., Felsberger, W., Baratieri, M., Gölles, M.: Assessment of the Behaviour of a Commercial Gasification Plant During Load Modulation and Feedstock Moisture Variation. Waste and Biomass Valorization. (2019).
Doi: 10.1007/s12649-019-00714-w.
Journal Impact Factor: 2.358 (2018)

29. Pecchi, M., **Patuzzi, F.**, Benedetti, V., Di, R., Baratieri, M.: Thermodynamics of hydrothermal carbonization: Assessment of the heat release profile and process enthalpy change. Fuel Processing Technology. 197, 106206 (2020).
Doi:10.1016/j.fuproc.2019.106206
Journal Impact Factor: 4.507(2018)

30. Benedetti, V., Ail, S.S., **Patuzzi, F.**, Cristofori, D., Rauch, R., Baratieri, M.: Investigating the feasibility of valorizing residual char from biomass gasification as catalyst support in Fischer-Tropsch synthesis. Renew. Energy. 147, 884–894 (2020).
Doi: 10.1016/j.renene.2019.09.050
Journal Impact Factor: 5.439(2018)

Conference proceedings

1. Pieratti, E., **Patuzzi, F.**, Baratieri, M., Baggio, P., Grigiante, M.: Parametric analysis of small scale biomass gasification plants. In: ETA Florence (ed.) 16th European Biomass Conference & Exhibition. pp. 1019–1024. , Valencia, Spain (2008)
2. **Patuzzi, F.**, Mimmo, T., Baratieri, M.: Grass biomass for energy use: experimental study and analytical model on the characterization of torrefaction and pyrolysis. 19th International Symposium on Alcohol Fuels. pp. 113–118. , Verona, Italy (2011)
3. Baratieri, M., **Patuzzi, F.**, Thevs, N., Zerbe, S.: Assessment of suitable energy conversion scenarios of common reeds, *Phragmites australis*. In: ETA Florence (ed.) 19th European Biomass Conference & Exhibition. pp. 1501–1514. , Berlin, Germany (2011)
4. **Patuzzi, F.**, Baratieri, M.: Multistage modeling and experimental design for the assessment of suitable energy conversion scenarios of wetland biomass. 66° Congresso ATI. , Rende, Cosenza, Italy (2011)
5. **Patuzzi, F.**, Köbbing, J.F., Beckmann, V., Thevs, N., Zerbe, S., Baratieri, M.: Evaluation of common reeds potential for energy production in Wuliangsuhai Lake (Inner Mongolia, China). In: ETA Florence (ed.) 20th European Biomass Conference and Exhibition. pp. 2353–2361. , Milan, Italy (2012)
6. **Patuzzi, F.**, Roveda, D., Mimmo, T., Karl, J., Baratieri, M.: Characterization of the tar produced during pyrolysis of common reed: comparative study between on-line and off-line measuring method approaches. In: ETA Florence (ed.) 20th European Biomass Conference and Exhibition. pp. 997–1004. , Milan, Italy (2012)
7. Prando, D., **Patuzzi, F.**, Pernigotto, G., Gasparella, A., Baratieri, M.: Modeling analysis of biomass gasification MCHP systems for residential applications. In: ETA Florence (ed.) 20th European Biomass Conference and Exhibition. pp. 1058–1064, Milan, Italy (2012)
8. **Patuzzi, F.**, Gasparella, A., Baratieri, M.: Thermochemical and fluidynamic model of a torrefaction reactor: assessment of a two step kinetic scheme. In: Nzihou, A. and Castro, F. (eds.) 4th International Conference on Engineering for Waste and Biomass Valorisation. pp. 1301–1306 , Porto, Portugal (2012)
9. Vecchi, G.V., **Patuzzi, F.**, Baggio, P., Baratieri, M.: CHP gasification systems fed by torrefied biomass: assessment of the energy performance. In: Nzihou, A. and Castro, F. (eds.) 4th International Conference on Engineering for Waste and Biomass Valorisation. pp. 847–852, Porto, Portugal (2012)
10. Prando, D., **Patuzzi, F.**, Pernigotto, G., Gasparella, A., Baratieri, M.: Buildings and biomass cogeneration systems: integrated simulation approach. In: Baratieri, M., Corrado, V., Gasparella, A. and **Patuzzi, F.** (eds.) Building Simulation Applications - BSA 2013. pp. 253–262, Bozen-Bolzano University Press, Bolzano, Italy (2013)

11. Prando, D., **Patuzzi, F.**, Pernigotto, G., Gasparella, A., Baratieri, M.: Biomass CHP Systems for Residential Applications: a Multi-Stage Modeling Approach. In: Kabele, K., Urban, M., Suchý, K. and Lain, M. (eds.) CLIMA 2013 - 11th REHVA World Congress and the 8th International Conference on Indoor Air Quality, Ventilation and Energy Conservation in Buildings. pp. 3309–3318, Society of Environmental Engineering (STP): Prague, Czech Republic (2013)
12. Ng, F.B., Guzzomi, A.L., Chua, H.T., Wang, X., **Patuzzi, F.**, Baratieri, M., Mimmo, T.: Olive pomace requirements for small combustion applications in Western Australia: experimental and modelling analysis. In: ETA Florence (ed.) 21th European Biomass Conference & Exhibition. pp.230-234 , Copenhagen, Denmark (2013)
13. Vakalis, S., Prando, D., **Patuzzi, F.**, Mimmo, T., Gasparella, A., Tirler, W., Dal Savio, S., Chiaramonti, D., Prussi, M., Baratieri, M.: Experiences in biomass gasification in South-Tyrol: the "GAST" project. In: ETA Florence (ed.) 21th European Biomass Conference & Exhibition. pp.891-901, Copenhagen, Denmark (2013)
14. **Patuzzi, F.**, Ciuta, S., Baratieri, M., Mimmo, T., Castaldi, M. J.: Intraparticle gas sampling during biomass non-oxidant thermal treatment for kinetic behavior study. In: IT3/HWC, 32nd International Conference on Thermal Treatment Technologies & Hazardous Waste Combustors, San Antonio, TX (2013)
15. Vakalis, S., Prando, D., **Patuzzi, F.**, Mimmo, T., Gasparella, A., Tirler, W., Dal Savio, S., Chiaramonti, D., Prussi, M., Baratieri, M.: Measuring the performance of biomass small scale gasification plants by implementing mass and energy balances. In: 4th Central European Biomass Conference. Graz, Austria (2014)
16. **Patuzzi, F.**, Ciuta, S., Castaldi, M.J., Baratieri, M.: Pyrolysis of a single wooden particle: a numerical model calibrated versus intraparticle gas sampling measurements. In: ETA Florence (ed.) 22nd European Biomass Conference & Exhibition. pp. 912-919, Hamburg, Germany (2014)
17. **Patuzzi, F.**, Prando, D., Baratieri, M.: Pyrolysis of common reed: thermal analysis of the feedstock and characterization of pyrolysis products. In: ETA Florence (ed.) 22nd European Biomass Conference & Exhibition. pp. 1134-1139, Hamburg, Germany (2014)
18. Basso, D., **Patuzzi, F.**, Baratieri, M., Fiori, L.: Thermo-fluid model of a batch hydrothermal carbonization reactor. In: ETA Florence (ed.) 22nd European Biomass Conference & Exhibition. pp. 987-990, Hamburg, Germany (2014)
19. Basso, D., **Patuzzi, F.**, Castello, D., Baratieri, M., Fiori, L.: Modeling the reaction kinetics during hydrothermal carbonization of waste biomass. In: ETA Florence (ed.) 22nd European Biomass Conference & Exhibition. pp. 1269-1273, Hamburg, Germany (2014)
20. Vakalis, S., Prando, D., **Patuzzi, F.**, Baratieri, M.: Thermodynamic modelling of biomass downdraft gasifiers: introduction to the "multi-box" concept. In: ETA Florence (ed.)

22nd European Biomass Conference & Exhibition. pp. 637-640, Hamburg, Germany (2014)

21. Vakalis, S., Prando, D., **Patuzzi, F.**, Mimmo, T., Gasparella, A., Tirler, W., Mair, K., Voto, G., Chiaramonti, D., Rizzo, A., Pettorali, M., Prussi, M., Dal Savio, S., Andreasi, D., Baratieri, M.: Assessment of a test methodology suitable for small scale gasification systems. In: ETA Florence (ed.) 22nd European Biomass Conference & Exhibition. pp. 579-584, Hamburg, Germany (2014)
22. Prando, D., Rizzo, A.M., Vakalis, S., **Patuzzi, F.**, Gasparella, A., Chiaramonti, D., Baratieri, M.: Monitoring of two CHP systems based on biomass in northern Italy: boiler-ORC and gasifier-ICE. In: Nzihou, A., Guerreiro, S., and Silva Lora, E. (eds.) 5th International Conference on Engineering for Waste and Biomass Valorisation (WasteEng 2014). pp. 1108–1118. Mines d'Albi, France, Rio de Janeiro, Brazil (2014)
23. **Patuzzi, F.**, Ciuta, S., Castaldi, M.J., Baratieri, M.: Thermochemical and fluidynamic model of a wood particle subjected to pyrolysis supported by intraparticle gas sampling. In: Nzihou, A., Guerreiro, S., and Silva Lora, E. (eds.) 5th International Conference on Engineering for Waste and Biomass Valorisation (WasteEng 2014). pp. 742–754. Mines d'Albi, France, Rio de Janeiro, Brazil (2014)
24. Basso, D., **Patuzzi, F.**, Baratieri, M., Fiori, L.: Hydrotermal carbonization of grape marc: experimental results and reaction kinetics modeling. In: Nzihou, A., Guerreiro, S., and Silva Lora, E. (eds.) 5th International Conference on Engineering for Waste and Biomass Valorisation (WasteEng 2014). pp. 980–991. Mines d'Albi, France, Rio de Janeiro, Brazil (2014)
25. Ciuta, S., **Patuzzi, F.**, Baratieri, M., Castaldi, M.J.: Wood pyrolysis study by thermal analysis correlated with innovative intra-particle sampling technique. In: IT3/HWC, 33rd International Conference on Thermal Treatment Technologies & Hazardous Waste Combustors. Baltimore, MD (2014)
26. Fiori, L., Basso, D., **Patuzzi, F.**, Weiss-Hortala, E., Castello, D., Baratieri, M.: Hydrothermal carbonization for wet wastes management. In: Fava, F. (ed.) Ecomondo: a mediterranean platform for the sustainable growth. pp. 269–273. Maggioli Editore, Rimini, Italy (2014)
27. Ciuta, S., **Patuzzi, F.**, Baratieri, M., Castaldi, M.J.: Reaction sequence understanding during pyrolysis and gasification of biomass via intra-particle gas sampling. Venice 2014: V International Symposium on Energy from Biomass and Waste. CISA Publisher, San Servolo, Venezia (2014)
28. Basso, D., **Patuzzi, F.**, Weiss-Hortala, E., Rada, E.C., Castello, D., Baratieri, M., Fiori, L.: Waste to biofuel through hydrothermal carbonization. Venice 2014: V International Symposium on Energy from Biomass and Waste. CISA Publisher, San Servolo, Venezia (2014)
29. Pernigotto, G., Prada, A., **Patuzzi, F.**, Baratieri, M., Gasparella, A.: Experimental characterization of the dynamic thermal properties of opaque elements under dynamic periodic solicitation. In: Baratieri, M., Corrado, V., Gasparella, A. and

Patuzzi, F. (eds.) Building Simulation Applications - BSA 2015. Bozen-Bolzano University Press, pp. 547-555, Bolzano, Italy (2015)

30. Pernigotto, G., Prada, A., **Patuzzi, F.**, Baratieri, M., Gasparella, A.: Characterization of the Dynamic Thermal Properties of the Opaque Elements Through Experimental and Numerical Tests. Energy Procedia. 78, 3234-9 (2015)
31. Vakalis, S., **Patuzzi, F.**, Prando, D., Mair, K., Chiaramonti, D., Dal Savio, S., Baratieri, M.: Monitoring and analysis of representative small scale biomass gasifiers in South Tyrol. From Biomass to Power and Heat 2015. , Zittau, Germany (2015).
32. Ahmad, J.F., **Patuzzi, F.**, Prando, D., Castaldi, M.J., Baratieri, M.: Possible utilization pathways of char from real scale biomass gasifiers. In: Nzihou, A. (ed.) 6th International Conference on Engineering for Waste and Biomass Valorisation (WasteEng 2016), pp. 881–9, Mines Albi, Albi, France (2016)
33. **Patuzzi, F.**, Prando, D., Vakalis, S., Mimmo, T., Mair, K., Chiaramonti, D., et al. Experiences in biomass gasification in South Tyrol: energy and environmental assessment. In: Nzihou, A. (ed.) 6th International Conference on Engineering for Waste and Biomass Valorisation (WasteEng 2016), pp. 939–53, Mines Albi, Albi, France (2016)
34. Basso, D., **Patuzzi, F.**, Weiss-Hortala, E., Baratieri, M., Contò, P., Fiori, L.: Hydrochar from EWC 19.12.12 as a substitute of carbon black. In: Nzihou, A. (ed.) 6th International Conference on Engineering for Waste and Biomass Valorisation (WasteEng 2016). pp. 608–620. Mines Albi, Albi, France (2016)
35. Martinelli, M., **Patuzzi, F.**, Prando, D., Stauder, M., Baratieri, M.: Common reed co-combustion in a woodchip boiler of 3 MW: effects on pollutant emissions. In: Nzihou, A. (ed.) 6th International Conference on Engineering for Waste and Biomass Valorisation (WasteEng 2016), pp. 572–9, Mines Albi, Albi, France (2016)
36. Ahmad, J., Cordioli, E., **Patuzzi, F.**, Prando, D., Castaldi, M., Baratieri, M.: Possible utilization pathways of char from biomass thermochemical conversion: char as a catalytic filtering medium for tar cracking. In: ETA Florence (ed.) 24th European Biomass Conference & Exhibition. pp. 475–479. , Amsterdam, The Netherlands (2016)
37. Prando, D., **Patuzzi, F.**, Ahmad, J., Mimmo, T., Baratieri, M.: Environmental Impact of Char from Four Commercial Gasification Systems. In: ETA Florence (ed.) 24th European Biomass Conference & Exhibition. pp. 828–830. , Amsterdam, The Netherlands (2016)
38. Martinelli, M., **Patuzzi, F.**, Prando, D., Stauder, M., Baratieri, M.: Evaluation of Common Reeds Potential for Heat Production: a Case Study in Caldaro Lake (Italy). In: ETA Florence (ed.) 24th European Biomass Conference & Exhibition. pp. 772–776. , Amsterdam, The Netherlands (2016)
39. Cordioli, E., **Patuzzi, F.**, Baratieri, M.: Experimental and modelling analysis of char decomposition: experiences with real

scale gasification systems. Energy Procedia (The 8th International Conference on Applied Energy – ICAE2016). 105, 724–729 (2016)

40. Benedetti, V., **Patuzzi, F.**, Baratieri, M.: Gasification char as a potential substitute of activated carbon in adsorption applications. Energy Procedia (The 8th International Conference on Applied Energy – ICAE2016). 105, 712–717 (2016)
41. Cordioli, E., **Patuzzi, F.**, Baratieri, M.: Analysis of biomass chars thermal decomposition: experimental tests and modelling in N2 and CO2 atmosphere. In: ETA Florence (ed.) 25th European Biomass Conference and Exhibition. pp. 743–746. , Stockholm, Sweden (2017).
42. Basso, D., **Patuzzi, F.**, Gasparella, A., Tirler, W., Dal Savio, S., Rizzo, A.M., Chiaramonti, D., Baratieri, M.: Valorization pathways for char from small scale gasification systems in South-Tyrol: the "NEXT GENERATION" project. In: ETA Florence (ed.) 25th European Biomass Conference and Exhibition. pp. 747–750. , Stockholm, Sweden (2017).
43. Benedetti, V., **Patuzzi, F.**, Baratieri, M.: Biomass gasification char as a low-cost adsorbent for CO2 capture. In: ETA Florence (ed.) 25th European Biomass Conference and Exhibition. pp. 760–764. , Stockholm, Sweden (2017).
44. Caligiuri, C., Antolini, D., **Patuzzi, F.**, Renzi, M., Baratieri, M.: Modelling of a small scale energy conversion system based on an open top gasifier coupled with a dual fuel diesel engine. In: ETA Florence (ed.) 25th European Biomass Conference and Exhibition. pp. 788–793. , Stockholm, Sweden (2017).
45. Basso, D., Vakalis, S., **Patuzzi, F.**, Gasparella, A., Tirler, W., Dal Savio, S., Rizzo, A., Chiaramonti, D., Baratieri, M.: The "NEXT GENERATION" project: valorization alternatives for char from small scale gasification systems in South-Tyrol. In: 5th International Conference on Sustainable Solid Waste Management. *In press*, Athens, Greece (2017)
46. Marchelli, F., **Patuzzi, F.**, Cordioli, E., Sisani, E., Barelli, L., Baratieri, M., Bosio, B., Arato, E.: Adsorption of H2S on Residual Biomass Gasification Char. In: 26th European Biomass Conference and Exhibition. pp. 493–499. ETA-Florence Renewable Energies, Copenhagen, Denmark (2018)
47. Antolini, D., Shivananda Ail, S., **Patuzzi, F.**, Grigiante, M., Baratieri, M.: Experimental Investigations of Combined Biomass and CO2 Gasification in a Downdraft Gasifier. In: 26th European Biomass Conference and Exhibition. pp. 732–736. ETA-Florence Renewable Energies, Copenhagen, Denmark (2018)
48. Benedetti, V., Ail, S.S., **Patuzzi, F.**, Rauch, R., Baratieri, M.: Valorization of Char from Biomass Gasification as Catalyst Support: Preliminary Results of Fischer-Tropsch Tests. In: 26th European Biomass Conference and Exhibition. pp. 940–946. ETA-Florence Renewable Energies, Copenhagen, Denmark (2018)
49. Basso, D., **Patuzzi, F.**, Valentinuzzi, F., Mimmo, T., Tonon, G.,

Baratieri, M.: Bioenergy and other High-Value Products to Enhance Soil Fertility and Mitigate Climate Change: the WOOD-UP Project on Woody Biomass Gasification in South-Tyrol. In: 26th European Biomass Conference and Exhibition. pp. 1080–1083. ETA-Florence Renewable Energies, Copenhagen, Denmark (2018)

50. Antolini, D., Shivananda, A.S., **Patuzzi, F.**, Grigiante, M., Baratieri, M.: Experimental and modeling analysis of Air and CO2 biomass gasification in a reverse lab scale downdraft gasifier. Energy Procedia. 158, 1182–1187 (2019). doi:10.1016/j.egypro.2019.01.304
51. Paini, J., Benedetti, V., Scampicchio, M., Baratieri, M., Patuzzi, F.: Thermochemical valorization of spent apple pomace: preliminary assessment by thermogravimetric analysis coupled with evolved gas characterization. In: 7th International Conference on Sustainable Solid Waste Management. , Heraklion (2019)
52. Benedetti, V., Cordioli, E., Marchelli, F., Patuzzi, F., Baratieri, M.: Valorisation of char residues from biomass gasification in adsorption applications. In: 7th International Conference on Sustainable Solid Waste Management. , Heraklion (2019)
53. Menin, L., Benedetti, V., Patuzzi, F., Vakalis, S., Baratieri, M.: The feasibility of integrating biomass steam gasification and syngas biomethanation to store renewable energy as methane gas. In: 7th International Conference on Sustainable Solid Waste Management. , Heraklion (2019)
54. Basso, D., Pecchi, M., **Patuzzi, F.**, Pavanetto, R., Baratieri, M.: Hydrothermal carbonization of wet biomass: a new reactor design for continuous lab tests on the three HTC products. In: 27th European Biomass Conference and Exhibition. pp. 1146–1148. ETA-Florence Renewable Energies, Lisbon, Portugal (2019)
55. **Francesco, P.**, Antolini, D., Bonzi, G., Vakalis, S., Baratieri, M.: Char recirculation for improving the conversion yields in fixed bed gasification systems. In: 27th European Biomass Conference and Exhibition. pp. 527–532. ETA-Florence Renewable Energies, Lisbon, Portugal (2019)
56. Pecchi, M., **Patuzzi, F.**, Baratieri, M.: Thermodynamic model for the ash fraction behavior in biomass gasification using the cantera tool with the NASA polynomial approach. In: 27th European Biomass Conference and Exhibition. pp. 931–935. ETA-Florence Renewable Energies, Lisbon, Portugal (2019)
57. Benedetti, V., Ail, S.S., Cordioli, E., **Patuzzi, F.**, Baratieri, M.: Use of Char from Biomass Gasification as Co2 Adsorbent and Catalyst Support: Experimental Analysis and Results. In: 27th European Biomass Conference and Exhibition. ETA-Florence Renewable Energies, Lisbon, Portugal (2019)
58. Pecchi, M., Basso, D., Patuzzi, F., **Baratieri, M.**: Effect of Water Formation on the Reaction Enthalpy of the Hydrothermal Carbonization Process. In: 27th European Biomass Conference and Exhibition. pp. 1155–1159. ETA-Florence Renewable Energies, Lisbon, Portugal (2019)

59. Pecchi, M., **Patuzzi, F.**, Baratieri, M.: Evaluation of the Overall Reaction Enthalpy Change of Hydrothermal Carbonization Process by Means of Differential Scanning Calorimetry at High Pressure. In: 27th European Biomass Conference and Exhibition. pp. 1160–1163. ETA-Florence Renewable Energies (2019)
60. Piazzi, S., Ail, S.S., Benedetti, V., **Patuzzi, F.**, Baratieri, M.: Studies on conversion of syngas to liquid fuels via Fischer Tropsch synthesis. In: 27th European Biomass Conference and Exhibition. pp. 1262–1265. ETA-Florence Renewable Energies, Lisbon, Portugal (2019)
61. Cordioli, E., Vakalis, S., **Patuzzi, F.**, Baratieri, M.: Analyzing the balances of model tar compounds in a char-bed tar cracking reactor. In: 27th European Biomass Conference and Exhibition. ETA-Florence Renewable Energies, Lisbon, Portugal (2019)
62. Antolini, D., Ail, S.S., Vakalis, S., **Patuzzi, F.**, Baratieri, M.: Enhancement of the load modulation capability of a pilot plant gasifier by means of secondary air control. In: 27th European Biomass Conference and Exhibition. pp. 802–806. ETA-Florence Renewable Energies, Lisbon, Portugal (2019)
63. Hollenstein, C., Zemann, C., Antolini, D., **Patuzzi, F.**, Martini, S., Baratieri, M., Gölles, M.: Evaluation of the operational behaviour of fixed-bed biomass gasifiers – a comparison of different approaches for steady-state analysis. In: 27th European Biomass Conference and Exhibition. pp. 849–860. ETA-Florence Renewable Energies, Lisbon, Portugal (2019)
64. Pezzola, L., Mussi, R., Magalotti, V., Baratieri, M., **Patuzzi, F.**, Wakizaka, H.: Alternative measurement methodologies for downdraft gasifier monitoring and control. In: 27th European Biomass Conference and Exhibition. ETA-Florence Renewable Energies, Lisbon, Portugal (2019)

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, Snehesh Shivananda Ail, Carlo Caligiuri, Francesco Patuzzi, Massimiliano Renzi, Marco Baratieri; theme: Thermoconversion & Catalysis

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

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"

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".

Language competences

Italian: mother tongue
English: very good reading, writing and verbal skills (CAE C1 certificate achieved in December 2012, internal unibz C1 certificate achieved in June 2018)
German: basic knowledge (A2 Goethe certificate achieved in June 2018)

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 08/01/2020

Signature

Academic Curriculum Vitae: Massimiliano Renzi

Personal information

Name: Massimiliano Renzi
Place and –date of birth: Loreto (AN), 24/12/1983
Nationality: italian
Address: Via Rezia 177, 39046 Ortisei (BZ)
Telephone numbers:
- Mobile: 333-6096736
- Office: 0471-017816

Fax: +39 471 017009
E-Mail: Massimiliano.renzi@unibz.it

University education

- Bachelor in Mechanical Engineering obtained on the 18/07/2005 at the Polytechnic University of Marche with full marks (110/110 cum laude)
- Master in Mechanical Engineering obtained on the 18/07/2005 at the Polytechnic University of Marche with full marks (110/110 cum laude)
- PhD in Energy obtained on the 17/01/2011 at the Polytechnic University of Marche with the evaluation "Excellent"
- Professional practice examination in the sector of industrial engineering, obtained in January Gennaio 2008 at the Polytechnic University of Marche

Present appointment

- **Senior Researcher** (RTD-B) in the scientific disciplinary sector ING-IND/08 at the Faculty of Science and Technology of the free University of Bozen/Bolzano
- Start of appointment: 01/02/2018
  - First RTD Junior contract: from 15/05/2012 to 31/01/2018
  - Present contract: Senior Researcher from 01/02/2018 (foreseen end of contract 31/01/2021)
- Level of appointment: Senior Researcher (RTD-B)
- Employer: Free University of Bozen/Bolzano, Faculty of Science and Technology
- Short description of the responsibilities: responsibilities within the scientific sector ING-IND / 08 (fluid machinery) with a research focus in the following areas: design, management, diagnosis, monitoring, environmental impact and experiments on fluid machines (gas, steam, water, combustion engines, pumps and compressors) and the insertion of these machines within the power generation and propulsion systems as well as to civil and industrial applications.
  Educational responsibilities in the area of fluid machines design and energy conversion systems.

Professional experience

I have **collaborated and worked in the academic spin-off of the Polytechnic University of Marche STRATEGIE srl** for more than three years.

Form / to	Professional level	Employer	Area of responsiblity
01/2009 – 05/2012	Project Manager	University spin-off S.TRA.T.E.G.I.E. srl	Desing of cogeneration power plants. Development of innovative solar concentration devices. Development of small-scale organic Rankine cycle (ORC) and innovative expanders and turbines. Study of an innovative multi-stage methane compression station for automotive applications.

In January 2009, I started my collaboration with the academic spin-off of the Polytechnic University of Marche, STRATEGIES srl. I have been involved in several projects in the field of thermo-fluid dynamics, design of innovative

turbines for ORC systems, cogeneration systems, desalination systems and compression and liquefaction facilities for natural gas distribution. After the first design activity the candidate became Project Manager for the development of a solar tracking and concentration system. The candidate has planned and coordinated the working group for the design and realization of the prototype. In addition, I realized an in-house ray- tracing software through which it is possible to evaluate the optical performance of any central tower solar-concentration heliostat system.
In this context, I coordinated the development of an innovative prototype of a high-concentration photovoltaic system. On 11 February 2010, the business idea was presented to the Green Technology Investment Forum organized by IBAN (Italian Business Angel Network) and the project was awarded among the winners. Afterwards, the project was funded by two major companies in the solar energy sector for a total of € 320,000 with the target to develop an industrialized system based on concentrated solar power. I was the co-founder of a start-up company, ISIDE srl, which has developed and driven the pre-industrialization of two innovative solutions in the field of solar thermal and photovoltaic concentration technology. In this particular field, the applicant has designed and developed a series of prototypes of concentration solar photovoltaic systems, that consist of the following macro-components: the solar tracker, the primary and secondary optics, the receiver and the photovoltaic cell.
In particular, the concentration solar thermal system was presented at the Zero Emission Rome fair in September 2012.

The candidate has also developed an innovative tracking system to be applied to concentrating photovoltaic systems that is extremely compact, lightweight and accurate in the solar tracking. These characteristics allow its application also for architectural integration. These solutions were patented and they are now in the phase of international extension at the UIBM "solar tracking device and concentration for Photovoltaic Cells".

Awards

Awards received:

- Research prize 2020 sponsored by Stiftung/Fondazione Sparkasse/Cassa di Risparmio of Bozen/Bolzano on the topic of Pump as Turbines as energy recovery devices in the Alpine region
- For the business idea on the small-scale solar concentration photovoltaic converters for architectural integration, I won the prize of the Green Technology Investment Forum organized by IBAN (Italian Business Angel Network) on the 11th of February 2010.
- The innovative development of solar concentration optics was presented to a jury and I won, in April 2012, a training course at the Vrije Univisiteit of Brussels in the framework of the European project ACTMOST (Access to Micro-Optics Expertise, Services & Technologies). The project was supported by the Seventh Framework program of the European community for using an optical simulation software for solar concentration applications
- Co-author of the two following papers that received the best paper award prize
    - D. Antolini, S. S. Ail, C. Caligiuri, F. Patuzzi, M. Renzi, M. Baratieri, **Load modulation capability of an open top gasifier varying the second stage air flow rate**, WasteEng18 - 7th International Conference on Engineering for Waste and Biomass Valorisation – July 2-5, 2018 Prague, Czech Republic.
    - Alberizzi JC, Rossi M, Renzi M. **Optimal sizing of an off-grid hybrid photovoltaic–wind system with battery storage for a mountain lodge in south-tyrol using a mixed integer linear programming (MILP) algorithm**. Proceedings of ICEER2019 - 6th International Conference on Energy and Environment Research: "Energy and environment: challenges towards circular economy", Lisbon (Portugal), 22-25 July 2019.

Patents of which I'm co-inventor:

- Solar tracker and its battery of trackers (N. ITAN2009 0067 29/03/2011; N. WO2011036290 31/03/2011)
- Solar tracking and solar concentration device for photovoltaic cells (N. ITAN20130094 of 16.11.2014; No WO2014184815 of 11.20.2014)
- Connection method of a photovoltaic receiver to a relative support (N. ITAN20130093 of 16.11.2014)
- Photovoltaic converter based on solar concentration (N. ITAN20130092 of 11.16.2014)
- Photovoltaic converter based on solar concentration (N. ITAN20130091 of 11.16.2014)

Experiences in the didactic activity

- **Didactic activity at the Free University of Bozen/Bolzano**:
  - In the academic years 2013/2014, 2014/2015, 2015/2016, 2016/2017, 2017/2018, 2018/2019 and 2018/2019 I have carried out my teaching activities, support for students and exam evaluation activities for the following courses:
    - **Lecturer of the course of Fluid Machines** (6 ECTS, lectures in English) at the Free University of Bolzano, Faculty of Science and technology, Bachelor in Industrial Mechanical Engineering
    - **Lecturer of the course of Thermal engines** (6 ECTS, lectures in English) at the Free University of Bolzano, Faculty of Science and technology, Master in Energy Engineering
  - In the academic year 2012/2013, I have carried out my teaching activities, support for students and exam evaluation activities for the following courses:
    - **Lecturer of the course of Fluid Mechanics** (6 ECTS, lectures in italian) at the Free University of Bolzano, Faculty of Science and technology, Bachelor in Industrial Mechanical Engineering

- **Supervision of several final thesis** as part of the **Bachelor in Industrial and Mechanical Engineering and the Master in Energy Engineering**

- **Supervision of PhD students**: supervisor of two students of the PhD course in Sustainable Energy and Technology, XXXI cycle, and of one student, XXXIII cycle, of the Faculty of Science and Technology, Free University of Bolzano.
  - Carlo Caligiuri (XXXI cycle): "Investigation and optimization of internal combustion engines for alternative fuels energy conversion"
  - Mosè Rossi (XXXI cycle): "Small-scale hydropower for energy recovery and production: a detailed fluid dynamic performance study of fluid machineries"
  - Francesco Nicolosi (XXXIII cycle): topic of the PhD will be the application of alternative new generation bio-fuels to feed micro-gas turbines in the distributed co-generation.
  - Jacopo Alberizzi (XXXIII cycle): topic of the PhD will be the study of pumping hydro and hybrid renewable generation systems as storage systems and as electric grid regulation systems.
  - Ruben Antona Garzon (XXXIV cycle): topic of the PhD will be the study of water jets in Pelton injectors using innovative numerical simulation tools to increase the performance of hydraulic turbines in off-design conditions.
  - Manuel Perez (XXXV cycle): proposed topic: thermal management of lithium-ion batteries for the automotive sector
  - Ermanno Grotti, Industrial PhD (XXXV cycle): partner company

Roechling Automotive. Proposed topic: thermal management of car powertrains based on internal combustion engines and novel propulsion solutions

- Claudia Tremonti, Industrial PhD (XXXV cycle): partner company Roechling Automotive. Proposed topic: thermal management of car powertrains based on internal combustion engines and novel propulsion solutions.

Other academic appointments

- Summary of the most significant **previous teaching activities**: in the academic year 2010/2011 and 2011/2012, I was lecturer of the Fluid dynamics course in the Bachelor of Energy Engineering, at the University e-Campus of Novedrate (CO). I have carried out my teaching activities, prepared lessons for the course and performed the final exam tests. In the academic year 2011/2012, I was lecturer of a teaching module on solar technologies within the Master of I and II level in "Renewable energy systems" at the University e-Campus of Novedrate (CO).

- **Member of the Scientific Committee of the PhD in Sustainable Energy Technologies** (SET) at the Free University of Bolzano
- **Vice-director of the study course Bachelor in Industrial Mechanical engineering (L-9) offered by the Free University of Bolzano**
- Member of the **evaluation committee for the admission to the PhD program in Sustainable Energy Technologies** of the Free University of Bozen-Bolzano – XXXII, XXXIII and XXXV cycle
- Member of the **committee for the final exam of the Ph.D. in Industrial Engineering - XXIX cycle and of the PhD** in Engineering Sciences – Energy and Mechanical and Management Engineering Curricula - XXVIII cycle, at the **Polytechnic University of Marche**, Faculty of Engineering
- **Member of the judging commission for State professional practice Exams of Senior Engineer and Junior Engineer** - industrial section, 2017 and 2018 at the University of Trento.
- Member of the **organizing committee of the conference** "mchp - micro cogeneration through biomass gasification" organized **at the Free University of Bozen / Bolzano** on 2-3 December 2016
- **Person in charge** (appointed by the Rector) **of the relationships and coordination with the other Universities** of the **Competence Centre** of the North-East Italy in the frame of the **Industry 4.0 plan**.
- **Member of the committee for the preparation of the new study plans and curricula** of the **Bachelor in Industrial Mechanical Engineering** (automation curriculum) and the new **Bachelor in Wood Engineering**.
- **Person in charge of the Erasmus+ agreement with the University of Ulster (Belfast, UK)** for the students of the Bachelor in Industrial and Mechanical Engineering at the Free University of Bolzano. The agreement is active since the academic year 2016/2017 for 5 academic years
- Person in charge for the **collaboration agreement with the Marche Polytechnic University**, Department of Industrial Engineering and Mathematical Sciences in teaching and research topics. The collaboration has been active from 13/06/2014 to 12/06/2016 and it has been renewed from 03/10/2017 to 03/10/2020.
- Person in charge for the **collaboration agreement with the University of Wuppertal (GER)**, in teaching and research topics. The collaboration is active from 05/07/2018 to 31/10/2020.
- **Safety manager for the laboratory C 0.01b** of the Free University of Bolzano "Electrical Machines and Machinery Fluid" since the academic year 2013/2014
- **Lab Manager of the laboratory C 0.01b** "Electrical Machines and Machinery Fluid" at the Free University of Bolzano since the academic year 2013/2014
- **Lab design and organization for the new NOI Tech Park** (ex speed-

line facilities)

- Member of the **evaluation committee of the entrance exam for the Bachelor in Industrial and Mechanical Engineering** at the Free University of Bolzano (since academic year 2015/2016 to year 2019/2020)
- **Representative of the Researchers** with fixed-term contract (RTD) **at the Faculty Council** of the Faculty of Science and Technology, Free University of Bolzano
- **Organization of the Summer School** on "Computational Fluid Dynamics" held in July 2016 at the Free University of Bolzano
- **Organization of the workshop** (part of the Series of lecture) "From smart grids to smart cities: the role of energy systems in future urban energy networks" at the Free University of Bolzano
- **Person in charge of the relationship with the Entrepreneurs' Association of South Tyrol** for the organization of educational seminars within the project "**The University meets the world of work**"
- **Tutoring activities** for the students in the Bachelor in Industrial and Mechanical Engineering
- **Orientation activities** in high schools and offering activities in the initiative **"Alternanza scuola-lavoro"**.

Membership to associations

I'm **member of the national coordination committee** of the professors and researchers belonging to the **scientific sectors ING-IND/08 and ING-IND/09**:

- Representative of the scientific sectors ING-IND/08 and ING-IND/09 for the Free University of Bolzano
- National meeting of professors of the scientific sectors ING-IND/08 and ING-IND/09

I'm member of the **Italian Association of Fluid Machines and Energy Conversion Systems (AIMSEA)** and of the **American Society of Mechanical Engineers (ASME)**.

Main research topics

Responsible of the research within the scientific sector ING-IND/08 (Fluid Machines) at the Free University of Bolzano with the research focus in the following areas: design, management, diagnosis, monitoring, environmental impact and experimentation on the fluid machines (gas, steam, hydraulic, combustion engines, pumps and compressors) and the insertion of these machines within the power generation and propulsion systems as well as the civil and industrial applications of fluid machines and energy systems.
In **March 2017 I received the national scientific qualification** (Abilitazione Scientifica Nazionale, ASN) **as Associate Professor** in the academic recruitment field 09/C1, fluid machinery, energy systems and power generation.

The **main areas of research** at the Free University of Bolzano are:

- Projects dealing with **fluid machinery and energy conversion systems** for the production of electrical and thermal energy
  - Internal project: **Design and study of the performance of a microcogeneration system using internal combustion engine fuelled by intermediate fuels from biomasses** (BioCHP) (principal investigator).
    The study project aims to study the micro-generation distributed systems, powered both by traditional fuels and with alternative fuels. In particular, the study focuses on small-scale internal combustion engines: the reduced cost and high reliability of these systems make them an extremely advantageous solution for the distributed production of electrical and thermal energy. The evaluation of the engine performance powered by alternative fuels, has required the design and realization of a specific test bench: the first year of work was employed for the acquisition of the measurement instrumentation and the design and the realization of the bench. The study allowed to assess the performance of a small engine size, that can be considered representative of the largest share of distributed generation systems. With the acquired instrumentation, it was possible to evaluated the performance of the engine, mainly in terms of

torque, power, consumption and emissions. Results were presented at various scientific conferences and research articles were published in high-level international journals (see publication sections).

- Internal project: **Indirect energy efficiency and torque assessment of internal combustion engines based on exhaust gas temperature and O_2 content** (i-ENGINE) (principal investigator).
  The goal of the project was to evaluate, by means of simple measurements, the performance and the efficiency of internal combustion engines for energy generation or agricultural use. The proposed solutions are based on the measurement of the exhaust gas oxygen content and temperature. Furthermore, the study will be extended to the use of renewable fuels that can reduce the environmental impact of this type of generation devices. This project makes use of the engine-brake bench which is installed in the laboratories of the Free University of Bolzano. A specific exhaust pipe for the test engine was designed to place the additional measurement instrumentation to validate the results of the project. The results of the experimental campaign have demonstrated a strong relationship between the temperature of the exhaust gas, the residual oxygen content and the motor power. In addition, the use of bioethanol allowed to quantify the reduction of pollutants produced by the engine when it is powered with alternative fuels. The research results were presented at various scientific conferences and published in international journal articles (see publication sections).

- Internal project: **Direct evaluation of the performance of internal combustion engines with the measurement of the indicated thermodynamic cycle** (INDY-CYCLE) (principal investigator). **Numerical simulation and indirect assessment of the performances of Diesel engines for agricultural purposes** (NGN-Performance) (co-investigator).
  The INDI-CYCLE and NGN-Performance projects have the aim of directly evaluating the conversion efficiency of internal combustion engines, as well as to develop 0D and 1D models for simulating small-sized internal combustion engines, fed with traditional and alternative fuels. In order to reduce the environmental impact of these machines, both in agricultural field and in the energy generation field, it is possible to use alternative fuels such as biodiesel to power Diesel engines. The use of alternative fuels, given the different nature of the fluid and the different chemical-physical characteristics, can affect both the injection system and the heat release in the combustion phase. A correct analysis of the entire system is, therefore, necessary to assess the impact on engine performance and emission of pollutants. The engine used for the tests is a single-cylinder diesel engine that embeds an "in-line pumping system" for the fuel feed. The experimental tests have shown that the use of alternative fuels implies a minor derating of the engine performance in terms of torque and power output. This variation is mainly dictated by the lower heating value of the biodiesel compared to conventional diesel fuel. Regarding the formation of pollutants, a typical characteristic of biodiesel is the increase of the concentration of NOx in the exhaust. To test the impact of these possible causes, they were carried out the tests on the engine making use of the pressure sensor in the combustion chamber. Thanks to this technique it was possible to evaluate the law of heat release, as well as the peak pressure within the combustion chamber. The results of the experiments have confirmed that the advance injection is a major cause of nitrogen

oxide exhaust training when you use biodiesel. Therefore, it is essential to maximize the engine fuel injection system in order to reduce the formation of pollutants when it makes use of alternative fuels. The experimental results have allowed to develop and also to calibrate the numerical simulations suitable to describe the operation of the small engine tested. It will develop, moreover, a general procedure for the definition of the basic parameters necessary to define the numerical simulations for the prediction of the small size performance of engines fed with traditional and alternative fuels. The research results were presented at various scientific conferences and published in international journal articles (see publication sections).

- Internal project: **Cogeneration system fed by solid fuels´ synthesis producer gas** (SYNGEN) (principal investigator); **Experimental measurement system of the heat recovered by micro cogeneration systems** (COGEN) (principal investigator).
  The aim of the project is to realize a prototype of a cogenerator based on an internal combustion engine fed in dual fuel mode with producer gas from biomass synthesis process. Currently, a biomass gasifier has been installed in the laboratories of biofuels LUB to be used in combination with a combustion engine. Based on the performance of the gasifier it was necessary to identify an engine having the proper characteristics for the use with producer gas. It was decided to use a diesel engine and to modify if for the operation in dual-fuel mode: this choice was dictated by the fact that the characteristics of the producer gas (greater antiknock) allow to use higher compression ratio engines. In fact, the producer gas operation of the internal combustion engine requires a premixed combustion, typical of Otto-cycle engines, and also an ignition process of the mixture. One of the possible solutions is the injection of diesel fuel that operates solely as an auto-ignition trigger for the combustion process; the remainder and most of the heat needed to power the engine comes from the producer gas that is mixed with the combustion air in the intake duct. The use of a motor in a dual-fuel operating mode entails the need to modify the diesel supply system. In fact, the fuel dosing must be reduced as to be solely a source of ignition for the combustion of the producer gas. Moreover, it is necessary to design a special carburetor in order to obtain the formation of a homogeneous mixture of air and producer gas at the entrance of the combustion chamber. Since the operation of the engine in dual-fuel mode requires a very accurate tuning of the supply of diesel fuel and producer gas, numerical simulations were carried out to calibrate the optimal management of the fuel supply before proceeding with the experimental part. Because of the characteristics of the producer gas, the combustion velocity of the mixture appears to be slowed down compared to a traditional fuel. Therefore, the risk of detonation or improper combustion becomes higher. At the moment, the simulations showed that the detonation phenomenon can be avoided by anticipating the injection of the diesel fuel with respect to the initial working condition and generating a producer gas-air mixture with an equivalence ratio ranging between 0.75 and 0.85 (lean mixture). The prototype is being built in the laboratories of the Free University of Bolzano. The internal combustion engine will be cooled down with a specific hydraulic circuit that allows to recover the rejected heat from the engine cooling water and from the lubricating oil, at a temperature of about 70 °C, and thereafter from the exhaust gases. Based on this design, all system components and measuring instruments were chosen. Both the primary circuit and the secondary cooling

circuit are provided with controllable valves in order to fine tune the cooling water flow and the working temperatures. Currently the various components were purchased and the first experimental tests are being executed. The research results were presented at various scientific conferences (see publication sections).

- Project financed with the second research funding call of the province of Bolzano: **Study of cogeneration and district heating plants powered by biomass wood chips** (GAST) (collaborator of the project). The research aimed to evaluate the performance of cogeneration plants and district heating systems fueled by biomass in the province of Bolzano. The cogeneration systems make it possible to simultaneously produce electricity and thermal energy through the use of biomass resulting from the forest wastes, agriculture wastes and the sawmill wastes. These are alternative fuels that significantly reduce the environmental impact of power generation systems. In particular, one of the monitored cogeneration plants utilizes a particular technology called Organic Rankine Cycle (ORC) systems: these plants are similar to traditional steam plants but they do not use steam as working fluid, but a siloxane fluid which allows the use of Rankine cycles even at low temperatures (obtained from the combustion of the biomass chips). For this reason, the coupling of a biomass boiler with an ORC plant is suitable for distributed cogeneration. The heat obtained from the condensation of the siloxane in the Rankine cycle is used to feed the district heating network. The research results were presented at various scientific conferences and also an article was published in an international journal (see publication sections).

- Internal Project: **Pollutant abatement solutions for small-scale cogeneration systems and combustion systems fed with traditional and alternative fuels (Clean Power) (principal investigator).** The aim of the present project is to study the possible solutions that can be adopted to cut the emissions of polluting agents produced in the combustion process in small-scale energy production systems that, currently, do not present specific or advanced devices to this purpose. Several test campaigns on small-scale combustion engines and biomass boilers have already been carried out in previous research projects and the emission figures of these energy generation devices are available for both particulate matter, CO and NOx. Therefore, the study will analyse the possible direct and indirect solutions that can be applied for the abatement of these pollutants. Specific fluid-dynamic and 1D simulations of the gas cleaning solutions will be carried out to clearly identify the best solutions. The different technologies will be analysed not only taking into account the abatement effectiveness, but also the cost and the system complexity. A test campaign will be carried out on the available co-generators and combustion systems. As regards the NOx, exhaust gas recirculation solutions, Lean NOx Traps (LNT) and Selective Catalytic Reduction (SCR) systems will be simulated and tested. The adoption of oxidation catalysts will be analysed in order to limit the emissions of CO and unburnt hydrocarbons. For the abatement of PM, specific filters will be analysed and evaluated for the application in biomass boilers and in internal combustion engines: the filter sizing, choice and regeneration will be object of the study. A collaboration with the University of Wuppertal is currently running on this topic (ref. Prof. Janoske).

- **Further research topics: study of microturbines with**

alternative fuels' supply and application of innovative gas cycles. The aim of the study is the analysis of the effects of the syngas feed in a micro gas turbine. An in-house developed simulation code allows to assess the behavior of the machine fueled by natural gas, both in a standard cycle with regeneration, and with an alternative cycle that adopts steam injection in the combustion chamber (STIG cycle). Subsequently, the code has been modified to simulate the behavior of the micro gas turbine when it is powered by alternative fuels. In particular, the change in the operating conditions were assessed for the case of syngas feed obtained from different gasification technologies and processes (pyrolysis of residues from forestry, gasification of biomass using steam as a gasifying agent, biomass gasification with air as a gasifying agent). The advantages and disadvantages of each solution have been well highlighted with particular reference to the variation in the operating conditions of the compressor and turbine. To obtain a greater degree of detail in the model, a specific code has been implemented using the Cantera library, which is capable of simulating the combustion chamber temperature and emissions. The combustion characteristics were analyzed, with particular reference to the changes in nitrogen oxides and carbon monoxide emissions. Solutions have been proposed to improve combustion in the case syngas use and steam injection strategies were implemented to reduce emissions. The research results were presented at various scientific conferences (see publication sections). Collaborations with the University of Mons and the Vrje Universitet Bruxelles have been activated on this research topic (exchange of PhD students and Master students).

- **Collaboration with the Polytechnic University of Marche**: Solar concentration technology. The concentrating solar power is one of the most promising technologies to improve the energy conversion from the solar energy source. Tests on both solar thermal systems for the production of heat at medium / high temperature as well as systems for the direct conversion into electricity were carried out. Innovative central-tower heliostat systems have been tested and a performance simulation model has been developed. In addition, the investigations were carried out for the optimization of the optical concentration in photovoltaic systems. The results of the experiments were published in several scientific articles and presented at several international conferences.
  In addition, hybrid generation systems consisting of plants powered by solar sources and traditional cogeneration systems have been studied with the aim of reducing the effects of unpredictable electric power production, intrinsically linked to the use of renewable resources. The results of the experiments have been published in various scientific articles and presented in various international conferences (see publication sections).

- **<u>Fluid Machines and energy generation systems from renewable energy sources</u>**
  - Free University of Bolzano (CRC call): **Efficiency improvement of micro-hydro plants** (μHT) (co-investigator). The wide availability of water resources in the province of Bolzano makes hydroelectric plants particularly attractive for power generation. Although most of the major basins have already been exploited, there are still many small streams that are not adequately exploited and that could represent a significant resource for the generation of clean electricity. The small streams, however, can have substantial and strong variations of flow and, sometimes, also pressure. This strongly

affects the performance of hydraulic turbines. In addition, hydro turbines can be used also for energy recovery purposes in water distribution networks and to exploit the available overpressure that must be dissipated. The objective of the research is to identify solutions to extend the operating working range of hydraulic machines, even in presence of highly variable loads. In this study, it has been proposed to insert an inverter between the electric generator and the electric grid in order to release the rotational speed of the impeller and optimize the design and the operation under varying external conditions. This solution guarantees the possibility to operate the plant under optimal operating conditions, even with sensible variations of the conditions of the water resources. Both theoretical evaluations and experimental tests on hydraulic machines have been carried out (mainly Pump as Turbines) in order to assess the behavior of the proposed systems and to suggest specific optimizations in order to increase the machine's performance. The results of the experiments have been presented in various international conferences (see publication sections).

- Third call for research, Law 14, Autonomous Province of Bolzano, project AI-ALPEN: **Supply of drinking water in alpine regions: piping loss reduction and energy optimization for long-term sustainability** (Principal Investigator for the workgroup of the Free University of Bolzano). This project is made in collaboration with the Department of Hydraulics of the University of Trento. The purpose of the project is to define appropriate methodologies for the characterization of the water network losses and ensure the optimum utilization of the power production potential in water supply systems. Indeed, in order to regulate and control the pressure level in the water distribution networks, the easiest solution is to use pressure regulation valves that are located in specific points of the net. Alternatively, it is possible to recover the pressure energy potential using hydropower turbines installed in the piping of the nets coming from mountain tanks. However, the innovative proposed solution should also be low-cost and easy to install in the available nets. An accurate on-site monitoring of water distribution networks has facilitated the assessment of the energy production potential and criticalities of the network. In addition, a specific test bench has been used together with numerical simulation tools for the description of the performance of hydraulic turbines (or Pump as turbines) that can be inserted into the water networks for energy recovery purposes. In order to reduce costs and simplify the installation of the machines, the optimal solution is the application of so-called "pump turbines as" (PaT) which are commercial centrifugal pumps fed with water in reverse operation for the production of electrical energy. Although this typology of machines has already been studied in literature, there is still a lack of design tools and knowledge to facilitate the choice of the proper machine to be used and to forecast their optimal operating conditions in turbine mode. The first part of the study was focused on the definition of a specific methodology to assess the design and the choice of the most proper machine to be used depending on the availability of water resource (pressure to be dissipated and flow rate). Innovative methodologies, such as statistical tools and neural networks, have been used to provide an accurate choice tool and to describe machine performance in design and in off-design working conditions. In fact, the machines installed in the water networks are subject to heavy fluctuations in flow, induced by the variability of the water demand by users. Studies have shown that PaTs suffer from a severe performance penalty when they are working in operating conditions far from optimal

ones. In this regard, fluid dynamics simulations were performed in order to predict the performance of the PaT in off-design working conditions and simple solutions are being evaluated to extend the optimal operating range. These design changes will also be tested using the experimental test bench. The technological solutions currently available are limited and there is still room for optimizing the design of the PaT in variable operating conditions. Furthermore, installation techniques and solutions can be evaluated to increase the performance of the machines and to exploit the potential residual energy recovery more efficiently.
Finally, a specific methodology will be provided to public bodies to sensitize local administrations on the prospects of this technology. The preliminary results of the experiments have been published in various scientific articles and presented in various international conferences (see publication sections).

- Free University of Bolzano (CRC call **THErmo-fluid DYnamics of Solid fuels Conversion systems: Optimization strategies** (THE-DYSCO) (co-investigator). The province of Bolzano is one of the Italian regions where woody biomass is mostly used for energy purposes as a renewable source. Over 70 district-heating and cogeneration plants with biomass are installed for the combined production of heat and electricity. The aim of this project is to develop the knowledge on solid fuel conversion systems and optimize their use, taking advantage of the competences in fluid mechanics, granular flows, computational fluid dynamics (CFD) and imaging methods, in synergy with other consolidated skills on thermodynamics and fluid machines applied to energy conversion systems. The project, which has just started, will have the objective of improving the efficiency of solid fuel conversion systems, with particular reference to fluidized bed reactors. In particular, the flow field of the oxidizing agent (air) and the interaction between gases and solids (inert and combustible) will be studied in order to optimize the gasifier performance. To achieve the objectives of the project, the research group will have the opportunity to perform experiments in the new thermo-fluid dynamics laboratory (LTFD) of the Technology Park; real prototypes will be studied and a complete equipment for definition of the flow filed with imaging techniques will be used to optimize the behaviour of the reactor for the production of clean gaseous fluids starting from biomasses, scraps and other solid fuels. In addition to the experimental methods, CFD (Computational Fluid Dynamics) tools will also be used to improve flow efficiency and reaction kinetics. The results of the simulations can be validated by means of experiments on cold models and will focus on the dynamics within the reactor and the air supply circuit, in order to achieve an optimization of the system as a whole.

- EU funding: **regional development founds** (EFRE/ERDF 2014-2020), Axis 1 research and innovation (Support for research infrastructures considered critical / crucial for the provincial system). **LTFD Project: Thermo-fluid dynamics laboratories**. In November 2016, the application for a "Capacity Building" research project was funded within the framework of the European Regional Development Projects (EFRE / ERDF). The project involves the construction of a thermo-fluid dynamics laboratory in which test lines will be installed to test compressible fluids, incompressible fluids and combustion systems to be applied to the study of fluid machines. The labs are not intended only to support research activities in the field of industrial flows and fluid machines for energy generation and energy efficiency, but also to enhance the collaboration with the innovative activities and companies in South Tyrol. The laboratories are being set up in the technology park

(ex-speed line area). They will be provided with the instrumentation for the advanced study of hydraulic machines (pumps and turbines) and compressible fluid machines, as well as cogeneration systems with internal combustion engines and micro gas turbines; test benches will be installed to characterize the thermo-fluid dynamic processes in the industrial field (gasification and heat exchange); finally, the phenomena linked to the combustion of traditional fuels and alternative fuels will be investigated. In addition to traditional methodologies, optical measurement techniques will be applied to study the fluid dynamics of fluid machines, thermo-fluid dynamics, sprays and combustion (PIV, LDV, PDPA). In the initial phase of the project (end of the project 2020), a broad study is in progress aimed at identifying the scientific instrumentation and the devices that are required for the development of the laboratory. Two other LUB professors participated to the funding request: prof. Righetti (Principal Investigator) and prof. Baratieri (Co-investigator).

- EU funding: **regional development founds** (EFRE/ERDF 2014-2020) in collaboration with companies. Project COOL-CAR: Thermal management of the accumulator batteries in electric and hybrid cars: optimization strategies for performance enhancing and for a sustainable mobility. In collaboration with **Roechling Automotive AG**. The purpose of this project is to study and optimize the thermal and energy flows of the car system with the primary objective of reducing the environmental impact, increasing the performance of accumulators and improving passenger comfort inside the cabin. For what concerns the operation of the motor part of the vehicle, there are several solutions that can be developed with the aim to increase the energy and environmental performance and the competitiveness of hybrid and full-electric vehicles: the automation of engine and battery coolant control valves, the use of electric water pumps with variable geometry and rotational speed, and the study of the thermo-fluid dynamics of the cooling process of the batteries. Unfortunately, to date, there are still a few practical examples in which the "smart" management strategies of vehicle thermal power flows are applied. Operatively, this part of the project involves setting up a series of test benches, in the laboratories of the new NOI Tech Park, to study the behaviour of batteries, simulating the real operating environmental conditions and the actual cycles of charge and discharge with electric motors. New innovative solutions for the battery pack cooling system of the electric vehicles, as well as the engine and lubrication system thermal management will be proposed; in parallel, a numerical analysis will be carried out, using simulation software, in order to evaluate the possible optimization strategies in the management and control of the flows of refrigerant liquids; this would make the propulsion system operate under optimum conditions, as a function of actual loading, of the start-up and cool-down phases. Management strategies will be proposed for the thermal and electric engine, the cooling of the energy storage system and the charging and discharge phases.

- EU funding: **regional development founds** (EFRE/ERDF 2014-2020) in collaboration with companies. Project TURB-HYDRO: Turbine Idrocinetiche, ottimizzazione per una produzione sostenibile. In collaboration with the local companies **Troyer and AC-TEC.** The project has the aim to develop, together with companies working on hydro turbines production, research activities for improvement of conventional and original hydro power turbines (mini-hydro). The research activities will include both Computational Fluid Dynamics studies and analyses on physical models of innovative solutions for mini hydro. The research activities will be developed in a time horizon of three years, they will include the installation of proper hydraulic circuits for physical modelling, one of them dedicated at pressure (operating pressure higher than 20 bar). The research results that will be obtained during the project, will not be solely submitted for publishing on scientific journals, but also "engineered" and applied to partner manufacturing machines. Therefore,

this should enable to improve the competitiveness of the products of the industrial partners and to acquire new market shares.

- Study within an **international collaboration** on micro hybrid networks powered by renewable sources and micro-cogeneration systems: I participated in the international research group of the **International Energy Agency (IEA)** in the context of Annex 54 "**Integration of Micro-Generation Energy and Related Technologies in Buildings**". In particular, I developed a model for determining the optimum size of the components of a hybrid generation system consisting of micro CHP and by generation plants based on renewable sources. Specifically, I studied the optimization of the individual elements of the micro-grid as a function of the user requests of energy (thermal and electrical demand of households and the tertiary sector) by making use of multi-objective optimization technique. Among the micro cogeneration systems, I defined a model for predicting the performance of a micro gas turbine, of an internal combustion engine and of a Stirling engine. In the context of renewable energy systems, I developed a model for the description of the performance of a concentration photovoltaic plant as a function of the environmental variables. The results of the studies have been published in several scientific articles and in international conferences (see publication sections).

- Project "**Design of more-electric tractors for a more sustainable agriculture**", founded by the Italian Ministry of Research PRIN (Progetto di Ricerca di Interesse Nazionale): Recently, I've been appointed as reference person and PI for a national PRIN project entitled "Design of more-electric tractors for a more sustainable agriculture" (acronym, Green SEED). This project aims to create the background, currently missing, to face the design of a complete more electric tractor system, identifying, among the others, the best electrification structure topology to be adopted, the load requirement for different operations and the components currently used that need to be redesigned. These further steps could be implemented in a larger project with the objective to design and build a real scale prototype of more-electric tractor involving more partners also in the frame of EU project, since the topic is within the priorities of the European Agency for Horizon 2020 about sustainable growth, in the Flagship Initiative "Resource efficient Europe".

- External funded research projects (commissioned research)
  - Customer: OTTANTUNO GROUP LLP. Research on the **role of coal in the context of the Italian energy system: regulations and technologies for energy production and the reduction of pollutants** (collaborator of the project). The OTTANTUNO GROUP LLP, the financing company, has requested the preparation of a report with the description of the Italian and the European coal market scenarios. The document describes the role of coal in the Italian energy context with particular reference to the production and import of the raw material and its use for the production of electrical energy.
  - Customer: Roechling automotive, Laives (BZ). **Fluid dynamic simulation of a refill circuit of an AdBlue tank of a Selective Catalytic Reducion (SCR) system for the abatement of NO_X emissions from the combustion in automotive diesel engines** (PI of the project). The aim of the project is to carry on fluid-dynamic simulations of the AD-Blue tank filling system; in particular, the objective is to evaluate the safety device of the refilling system that blocks the flow of Ad-Blue in the event of fluid backflow. The project was developed according to the following activities: checking the numerical settings of the preliminary model in Open Foam provided by the Company; control of physical settings; verification of the problems of parallelization of the numerical solution; sensitivity analysis of the mesh size; evaluation of the effect of turbulence models.

- Customer: Roechling automotive, Laives (BZ). **NOx abatement systems in automotive diesel engines based on Selective Catalytic Reduction (SCR) systems** (PI of the project). The work has the following primary objectives: to carry out a bibliographic analysis on the current NOx abatement systems and to analyze possible future developments of SCR technology and other abatement technologies that could be adopted in the automotive sector in view of the new emission limitations; to develop a simulation code to evaluate the performance of SCR abatement systems with integrated particle filter. Depending on the geometric variations of the catalyst and on the management strategy of the SCR system, a sensitivity analysis of NOx abatement performance has been carried out also taking into account the quantity and the injection mode of the AdBlue and the composition as well as the temperature and the flow rate of the exhaust gases.
- Customer: AC Tec, Caldaro (BZ). **Fluid dynamic simulation of a Kaplan hydraulic machine** (PI of the project). The project involves the realization of fluid-dynamic evaluations of a Kaplan hydraulic turbine to optimize its performance. The aim is to evaluate the macroscopic performance of the hydraulic machine (power and efficiency) and to evaluate how the boundary conditions of the simulation can affect the performance result of the machine.

List of the main funded research projects:

Date	PI of the project	Financing body	Title	Funding
01/01/2013	Massimiliano Renzi (PI)	Faculty internal funding	Design and study of the performance of a microcogeneration system using internal combustion engine fuelled by intermediate fuels from biomasses. (Bio-CHP)	5.200 €
01/01/2014	Luigi Alberti (PI), Massimiliano Renzi (co-investigator)	Libera Università di Bolzano Internal funding - CRC	Efficiency improvement of micro-hydro plants (μHT)	49.500 €
01/01/2014	Massimiliano Renzi (PI)	Libera Università di Bolzano Faculty internal funding	Indirect energy efficiency and torque assessment of internal combustion engines based on exhaust gas temperature and O_2 content (i-ENGINE)	2.550 €
21/10/2014	Massimiliano Renzi (PI), Marco Bietresato	Libera Università di Bolzano Faculty internal funding	Direct evaluation of the performance of internal combustion engines with the measurement of the indicated thermodynamic cycle (INDI-CYCLE)	2.500 €
01/01/2015	Marco Bietresato, Massimiliano Renzi (co-investigator)	Libera Università di Bolzano Faculty internal funding	Simulazione numerica e valutazione indiretta delle prestazioni di motori Diesel ad uso agricolo (NGN-Performance)	4.300 €
01/01/2015	Massimiliano Renzi (PI), Marco Baratieri, Luigi Alberti	Libera Università di Bolzano Faculty internal funding	Experimental measurement system of the heat recovered by micro cogeneration systems (COGEN)	15.000 €
15/06/2015	Massimiliano Renzi (PI), Marco Baratieri, Luigi Alberti	Libera Università di Bolzano Faculty internal funding	Cogeneration system fed by solid fuels´ synthesis producer gas	16.800 €
01/07/2016	Massimiliano Renzi (PI unità Libera Università di Bolzano)	Bolzano Province research call (terzo bando per la ricerca, provincia autonoma di	Supply of drinking water in alpine regions: piping loss reduction and energy optimization for long-term sustainability (AI-ALPEN)	148.703 €

		Bolzano)		
26/11/2016	Maurizio Righetti, Marco Baratieri, Massimiliano Renzi	Finanziamenti UE: Investimenti a favore della crescita e dell'occupazione (FESR 2014-2020), Asse 1 Ricerca ed innovazione	Thermo Fluid Dynamics, infrastructures for applied research to business and industry in South Tyrol	849.600 €
16/06/2017	Massimiliano Renzi (PI)	Libera Università di Bolzano – RTD call	Study of the combustion and of the engine management strategy of a dual fuel internal combustion engine fed with alternative fuels	19.990 €
01/11/2017	Michele Larcher, Marco Baratieri Massimiliano Renzi	Libera Università di Bolzano Internal funding - CRC	THErmo-fluid DYnamics of Solid fuels Conversion systems: Optimization strategies	100.000 €
26/04/2018	Marco Baratieri, Massimiliano Renzi	Finanziamenti UE: Investimenti a favore della crescita e dell'occupazione (FESR 2014-2020), Asse 1 b Ricerca ed innovazione	Thermal management of the accumulator batteries in electric and hybrid cars: optimization strategies for performance enhancing and for a sustainable mobility	874.600 €
26/04/2018	Maurizio Righetti, Massimiliano Renzi	Finanziamenti UE: Investimenti a favore della crescita e dell'occupazione (FESR 2014-2020), Asse 1 b Ricerca ed innovazione	Turbine Idrocinetiche, ottimizzazione per una produzione sostenibile	884.600 €
01/07/2018	Marco Bietresato (PI); Massimiliano Renzi (project collaborator)	Libera Università di Bolzano – RTD call	Effects of biofuels on lubricants performance in internal combustion for agricultural purposes (VISCOMOTOR)	14.500,00 €
01/09/2018	Marco Bietresato (PI); Massimiliano Renzi (project collaborator)	Libera Università di Bolzano Internal funding - CRC	Experimental investigation on the efficiency of agricultural machines powered with different fuels (BIO-TRACT-EFFICIENCY)	60.500,00 €
27/05/2019	Massimiliano Renzi (PI)	Libera Università di Bolzano – RTD call	Pollutant abatement solutions for small-scale cogeneration systems and combustion systems fed with traditional and alternative fuels	13.000,00 €
27/01/2020	Massimiliano Renzi (PI for the unit of Bolzano) – Project Partner	Italian Ministry of Research PRIN (researchers under the age of 40 years)	Design of more-electric tractors for a more sustainable agriculture	52'000,00 €

Additional allocations of funds were obtained from the Faculty of Science and Technology as part of the funding of research and teaching activities. These funds have been employed to set up an engine test stand, a micro-gas turbine test bed and to buy other measurement equipment.

List of the external funded research projects:

Date	PI of the project	Financing body	Title	Funding
10/2012	Andrea Gasparella, Massimiliano Renzi (collaboratore)	Contract OTTANTUNO GROUP LLP	Evaluation report: the coal based technologies in the Italian and European energy context and policies	4.700 €

05/2017	Massimiliano Renzi (PI)	Roechling automotive, Laives (BZ)	Simulazione fluidodinamica di un sistema di refilling di un serbatoio SCR (SCR-REF)	8.000 €
06/2017	Massimiliano Renzi (PI)	Roechling automotive, Laives (BZ)	Sistemi di abbattimento degli NOx nei motori a gasolio nel settore automotive	8.000 €
06/2017	Massimiliano Renzi (PI)	AC Tec, Caldaro (BZ)	Simulazioni fluidinamica di una macchina idraulica di tipo Kaplan	2.500 €
01/2020	Massimiliano Renzi (PI)	Revolt srl, Ancona (AN)	Analisi fluidodinamica di una cappa da cucina	2.250 €

Publications

Scopus database data (first record in 2011):
Number of records: 56
Number of citations: 617
H-index: 15
Threshold values for the national qualification (ASN) required in the academic recruitment field 09/C1: fluid machinery, energy systems and power generation

	Number of journal papers	**Number of citations**	**H - index**
Associate Professor	6	10	7
Full Professor	13	270	10
Commissioner	13	348	11

Papers published in **international Journals with Impact Factor and peer review**:

1. Bartolini C M, Caresana F, Comodi G, Pelagalli L, Renzi M, Vagni S. **Application of artificial neural networks to micro gas turbines**. *Energy Conversion and Management*. 2011:52;3552-3558. DOI: 10.1016/j.enconman.2010.08.003.
   Impact Factor: 7.182; Cite Score: 6.04.
2. Caresana F, Comodi G, Pelagalli L**,** Renzi M**,** Vagni S. **Use of a test-bed to study the performance of micro gas turbines for cogeneration applications**. *Applied thermal engineering*. 2011:31;781-788. DOI: 10.1016/j.applthermaleng.2011.07.016.
   Impact Factor: 3.356; Cite Score: 3.78.
3. Comodi G, Cioccolanti L, Renzi M, Pelagalli L, Vagni S, Caresana F. **A survey of cogeneration in the Italian pulp and paper sector**. *Applied thermal engineering*. 2013:54(1); 336-344. DOI: DOI: 10.1016/j.applthermaleng.2013.01.038.
   Impact Factor: 3.356; Cite Score: 3.78.
4. Renzi M, Brandoni C. **Study and application of a regenerative Stirling cogeneration device based on biomass combustion**. *Applied thermal engineering*, Vol. 67(1–2), pp. 341-351, 2014. DOI: 10.1016/j.applthermaleng.2014.03.045. Impact Factor: 3.356; Cite Score: 3.78.
5. Renzi M, Santolini M, Comodi G. **Performance analysis of a 3.5 kWp CPV system with two axis tracking**. *Energy Procedia*. 2014:61;220-224. DOI: 10.1016/j.egypro.2014.11.1075. Cite Score: 1.16.
6. Comodi G, Cioccolanti L, Renzi M. **Modelling household sector at municipal scale: micro-chp, renewables and energy efficiency measures**. *Energy*. 2014:68(15);92-103. DOI: 10.1016/j.energy.2014.02.055. Impact Factor: 5.589; Cite Score: 6.04.
7. Caresana F, Pelagalli L, Comodi G, Renzi M, **Microturbogas cogeneration systems for distributed generation: effects of ambient temperature on global performance and components' behaviour**. *Applied energy*. 2014:124(1);17-27. DOI: 10.1016/j.apenergy.2014.02.075. Impact Factor: 7.182; Cite Score: 7.78.
8. Brandoni C, Renzi M, Caresana F, Polonara F. **Simulation of hybrid renewable microgeneration systems for variable electricity**

prices. *Applied thermal engineering*. 2014:71(2);667–676. DOI: 10.1016/j.applthermaleng.2013.10.044. Impact Factor: 3.356; Cite Score: 3.78.

9. Renzi M, Caresana F, Pelagalli L, Comodi G**. Enhancing micro gas turbine performance in hot climates through fogging technique: experimental analysis**. *Applied energy*. 2014:135(15);165-173. DOI: 10.1016/j.apenergy.2014.08.084. Impact Factor: 7.182; Cite Score: 7.78.
10. Brandoni C, Renzi M. **Optimal sizing of hybrid solar micro-CHP systems for the household sector**. *Applied thermal engineering*. 2015:75(22);896–907. DOI: 10.1016/j.applthermaleng.2014.10.023. Impact Factor: 3.356; Cite Score: 3.78.
11. Renzi M, Bartolini CM, Santolini M, Arteconi A. **Efficiency assessment for a small heliostat solar concentration plant**. *International Journal of Energy Research*. 2014:39(2);265-278. DOI: 10.1002/er.3238. Impact Factor: 2.598; Cite Score: 2.44.
12. Prando D, Renzi M, Gasparella A, Baratieri M. **Monitoring of the energy performance of a district heating CHP plant based on biomass boiler and ORC generator**. *Applied thermal engineering*. 2015:79;98-107. DOI: 10.1016/j.applthermaleng.2014.12.063 Impact Factor: 3.356; Cite Score: 3.78.
13. Cioccolanti L, Savoretti A, Renzi M, Caresana F, Comodi G, **Design and test of a single effect thermal desalination plant using waste heat from m-CHP units**. *Applied thermal engineering*. 2015:82;18-29. DOI: 10.1016/j.applthermaleng.2015.02.047. Impact Factor: 3.356; Cite Score: 3.78.
14. Comodi G, Renzi M, Caresana F, Pelagalli L. **Enhancing micro gas turbine performance in hot climates through inlet air cooling vapour compression technique**. *Applied energy*. 2015:147;40-48. DOI: 10.1016/j.apenergy.2015.02.076. Impact Factor: 7.182; Cite Score: 7.78.
15. Comodi G, Renzi M, Caresana F, Pelagalli L. **Limiting the effect of ambient temperature on micro gas turbine performance through inlet air cooling techniques: an experimental comparison between fogging and direct expansion**. *Energy Procedia*. 2015:75;1172-1177. DOI: 10.1016/j.egypro.2015.07.561. Cite Score: 1.16.
16. Egidi L, Renzi M, Comodi G. **Effect of the secondary optics and the receiver design on the performance of a triple junction solar cell**. *Energy Procedia*. 2015:75;355-360. DOI: 10.1016/j.egypro.2015.07.387. Cite Score: 1.16.
17. Comodi G, Renzi M, Cioccolanti L, Caresana F, Pelagalli L. **Hybrid system with micro gas turbine and PV (photovoltaic) plant: guidelines for sizing and management strategies**. *Energy*. 2015:89;226-235. DOI: 10.1016/j.energy.2015.07.072. Impact Factor: 5.589; Cite Score: 6.04.
18. Renzi M, Egidi L, Comodi G. **Performance analysis of two 3.5kWp CPV systems under real operating conditions**. *Applied energy*. 2015:160;687-696. DOI: 10.1016/j.apenergy.2015.08.096. Impact Factor: 7.182; Cite Score: 7.78.
19. Bietresato M, Renzi M, Mischiatti S, Mazzetto F. **Engine test stand layout and post processing tools for the detection of many engine performance parameters**. *ARPN Journal of Engineering and Applied Sciences*. 2016:11(2);1309-1316. Cite Score: 0.37.
20. Cioccolanti L, Savoretti A, Renzi M, Caresana F, Comodi G. **Comparison of different operation modes of a single effect thermal desalination plant using waste heat from m-CHP units**. *Applied thermal engineering*. 2016:100;646-657. DOI: 10.1016/j.applthermaleng.2016.02.082. Impact Factor: 3.356; Cite Score: 3.78.
21. Comodi G, Renzi M, Rossi M. **Energy efficiency improvement in oil**

refineries through flare gas recovery technique to meet the emission trading targets. *Energy*. 2016:109;1-12. DOI: 10.1016/j.energy.2016.04.080. Impact Factor: 5.598; Cite Score: 6.04.
Renzi M, Bietresato M, Mazzetto F. **An experimental evaluation of the performance of a SI internal combustion engine for agricultural purposes fuelled with different bioethanol blends**. *Energy*. 2016:115;1069-1080. DOI: 10.1016/j.energy.2016.09.050. Impact Factor: 4.520; Cite Score: 5.17.

22. Renzi M, Bietresato M, Mazzetto F. **An experimental evaluation of the performance of a SI internal combustion engine for agricultural purposes fuelled with different bioethanol blends**. *Energy*. 2016:115;1069-1080. DOI: 10.1016/j.energy.2016.09.050. Impact Factor: 4.520; Cite Score: 5.17.
    Number of citations: 2.
23. Rossi M, Righetti M, Renzi M. **Pump-as-turbine for energy recovery applications: the case Study of an aqueduct**. *Energy procedia.* 2016:101;1207-1214. DOI: 10.1016/j.egypro.2016.11.163. Cite Score: 1.16 (2016).
24. Caligiuri C, Renzi M. **Combustion modelling of a dual fuel diesel-producer gas compression ignition engine**. *Energy procedia.* 2017:142;1395-1400 (2017).
25. Renzi M, Egidi L, Cioccolanti L, Comodi G. **Performance Simulation of a Small-scale Heliostat CSP System: Case Studies in Italy**. *Energy procedia.* 2017:105;367-372. DOI: 10.1016/j.egypro.2017.03.327. Cite Score: 1.16 (2017).
26. Renzi M, Riolfi C, Baratieri M. **Influence of the Syngas Feed on the Combustion Process and Performance of a Micro Gas Turbine with Steam Injection**. *Energy procedia.* 2017:105;1665-1670. DOI: 10.1016/j.egypro.2017.03.543. Cite Score: 1.16 (2017).
27. Renzi M, Cioccolanti L, Barazza G, Egidi L, Comodi G. **Design and experimental test of refractive secondary optics on the electrical performance of a 3-junction cell used in CPV systems**. *Applied energy*. 2017:185;233-243. DOI: 10.1016/j.apenergy.2016.10.064. Impact Factor: 7.182; Cite Score: 7.78 (2017).
28. Renzi M, Patuzzi F, Baratieri M. **Syngas feed of micro gas turbines with steam injection: effects on performance, combustion and pollutants formation**. Applied Energy. 2017:206;697-707. DOI: 10.1016/j.apenergy.2017.08.214. Impact Factor: 7.182; Cite Score: 7.78 (2017).
29. Carducci F, Giovannelli A, Renzi M, Comodi G, **Improving flexibility of industrial microgrids through thermal storage and HVAC management strategies**. *Energy Procedia*. Vol. 142, pp. 2728-2733. DOI: 10.1016/j.egypro.2017.12.217 (2017).
30. Renzi M, Cioccolanti L, Egidi L, Comodi G. **Experimental investigation and numerical model validation of a 2.5 kWt concentrated solar thermal plant**. Applied thermal engineering, 2018:133; 622-632, DOI: 10.1016/j.applthermaleng.2018.01.095 (2018).
31. Cioccolanti L, Renzi M. **Coupling a small-scale concentrated solar power plant with a single effect thermal desalination system: Analysis of the performance.** Applied thermal engineering, 2018:143;1046-1056, DOI: 10.1016/j.applthermaleng.2018.08.033 (2018).
32. Vakalis S, Caligiuri C, Moustaka, K., Malamis D, Renzi M, Baratieri M. **Modeling the emissions of a dual fuel engine coupled with a biomass gasifier—supplementing the Wiebe function.** Environmental Science and Pollution Research, 2018:25(36);35866-35873, DOI: 10.1007/s11356-018-1647-5 (2018).
33. Rossi M, Renzi M. **A general methodology for performance**

prediction of pumps-as-turbines using Artificial Neural Networks. Renewable Energy, 2018:128;265-274, DOI: 10.1016/j.renene.2018.05.060 (2018).

34. Nicolosi FF, Renzi M. **Effect of the Regenerator Efficiency on the Performance of a Micro Gas Turbine Fed with Alternative Fuels**. Energy Procedia, 2018:148:687-694, DOI: 10.1016/j.egypro.2018.08.158 (2018).
35. Alberizzi JC, Renzi M, Nigro A, Rossi M. **Study of a Pump-as-Turbine (PaT) speed control for a Water Distribution Network (WDN) in South-Tyrol subjected to high variable water flow rates.** Energy Procedia, 2018:148;226-233, DOI: 10.1016/j.egypro.2018.08.072 (2018).
36. Rossi M, Comodi G, Piacente N, Renzi M. **Effects of viscosity on the performance of Hydraulic Power Recovery Turbines (HPRTs) by the means of Computational Fluid Dynamics (CFD) simulations.** Energy Procedia, 2018:148:170-177, DOI: 10.1016/j.egypro.2018.08.046 (2018).
37. Caligiuri C, Renzi M, Bietresato M, Baratieri M. **Experimental investigation on the effects of bioethanol addition in diesel-biodiesel blends on emissions and performances of a micro-cogeneration system.** Energy Conversion and Management, 2019:185; 55-65, DOI: 10.1016/j.enconman.2019.01.097 (2019).
38. Bietresato M, Caligiuri C, Bolla A, Renzi M, Mazzetto F. **Proposal of a predictive mixed experimental-numerical approach for assessing the performance of farm tractor engines fuelled with diesel-biodiesel-bioethanol blends.** Energies, Vol. 12 (12), Article number 2287, DOI: 10.3390/en12122287 (2019).
39. Renzi M, Rudolf P, Štefan D, Nigro A, Rossi M. **Energy recovery in oil refineries through the installation of axial Pumps-as-Turbines (PaTs) in a wastewater sewer: A case study.** Energy Procedia, 2019:158:135-141, DOI: 10.1016/j.egypro.2019.01.058 (2019).
40. Rossi M, Nigro A, Pisaturo GR, Renzi M. **Technical and economic analysis of Pumps-as-Turbines (PaTs) used in an Italian Water Distribution Network (WDN) for electrical energy production.** Energy Procedia, 2019:158:117-122, DOI: 10.1016/j.egypro.2019.01.055 (2019).
41. Caligiuri C, Bietresato M, Renzi M. **The effect of using diesel-biodiesel-bioethanol blends on the fuel feed pump of a small-scale internal combustion engine.** Energy Procedia, 2019:158:953-958, DOI: 10.1016/j.egypro.2019.01.235 (2019).
42. Bietresato M, Caligiuri C, Renzi M, Mazzetto F. **Use of diesel-biodiesel-bioethanol blends in farm tractors: first results obtained with a mixed experimental-numerical approach.** Energy Procedia, 2019:158:965-971, DOI: 10.1016/j.egypro.2019.01.237 (2019).
43. Rossi M, Nigro A, Renzi M. **A predicting model of PaTs' performance in off-design operating conditions.** Energy Procedia, 2019:158:123-128, DOI: 10.1016/j.egypro.2019.01.056 (2019).
44. Rossi M, Renzi M. **A generalized theoretical methodology to forecast flow coefficient, head coefficient and efficiency of Pumps-as-Turbines (PaTs).** Energy Procedia, 2019:158:129-134, DOI: 10.1016/j.egypro.2019.01.057 (2019).
45. Rossi M, Nigro A, Renzi M. **Experimental and numerical**

assessment of a methodology for performance prediction of Pumps-as-Turbines (PaTs) operating in off-design conditions. Applied Energy, article: APEN 13127 (2019).

46. De Paepe W, Renzi M, Carrerro MM, Caligiuri C, Contino F. **Micro Gas Turbine Cycle Humidification for Increased Flexibility: Numerical and Experimental Validation of Different Steam Injection Models.** Journal of Engineering for Gas Turbines and Power, Paper No: GTP-18-1387; DOI:10.1115/1.4040859 (2019).
47. Moradi R, Cioccolanti L, Bocci E, Villarini M, Renzi M. **Numerical Investigation on the Performance of a Regenerative Flow Turbine for Small-Scale Organic Rankine Cycle Systems.** Journal of Engineering for Gas Turbines and Power, Vol. 141(9), Article number 091014, DOI: 10.1115/1.4044062 (2019).
48. Renzi M, Rudolf P, Štefan D, Nigro A, Rossi M. **Installation of an axial Pump-as-Turbine (PaT) in a wastewater sewer of an oil refinery: A case study.** Applied Energy, Vol. 250, pp. 665-676, DOI: 10.1016/j.apenergy.2019.05.052 (2019).
49. Campana C, Cioccolanti L, Renzi M, Caresana F**. Experimental analysis of a small-scale scroll expander for low-temperature waste heat recovery in Organic Rankine Cycle.** Energy, Vol. 187, Article Number 115929, DOI: 10.1016/j.energy.2019.115929 (2019).
50. Alberizzi JC, Renzi M, Righetti M, Pisaturo GR, Rossi M. **Speed and pressure controls of pumps-as-turbines installed in branch of water-distribution network subjected to highly variable flow rates.** Energies, Vol. 12, Issue 24, Article number 4738, DOI: 10.3390/en12244738 (2019)
51. Alberizzi JC, Rossi M, Renzi M. **Optimal sizing of an off-grid hybrid photovoltaic–wind system with battery storage for a mountain lodge in south-tyrol using a mixed integer linear programming (MILP) algorithm.** Proceedings of ICEER2019 - 6th International Conference on Energy and Environment Research: "Energy and environment: challenges towards circular economy", Lisbon (Portugal), 22-25 July 2019. Energy Reports Journal, Accepted paper, in press.
52. Štefan D, Rossi M, Hudec M, Rudolf P, Nigro A, Renzi M. **Study of the internal flow field in a pump-as-turbine (PaT): Numerical investigation, overall performance prediction model and velocity vector analysis.** Renewable Energy, in press, available on line, DOI: 10.1016/j.renene.2020.03.185 (2020).

Articles presented in **international conferences with scientific committee review**:

53. Arteconi A, Brandoni C, Renzi M, Polonara F. Design and energy performance of a ground plate heat exchanger coupled with a heat pump system. Third International Conference on Applied Energy (ICAE 2011), Perugia, Maggio 2011. ISBN 9788890584305.
54. Brandoni C, Renzi M, Arteconi A, Bartolini CM. Study of an innovative micro-CHP system fuelled by LPG. The 24th International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems (ECOS 2011), pp. 1794- 1807, Novi Sad (Serbia), Luglio 2011. ISBN 978-86-6055-016-5.
55. Renzi M, Bartolini CM, Santolini M. Investigation on the thermal performance of an innovative receiver for a solar dish Stirling system. Proceedings of the 15th International Stirling Engine Conference. Dubrovnik, Croatia, 27-29 September 2012, ISBN: 978-88- 8326-019-3.
56. Brandoni C, Renzi M. Hybrid renewable energy systems made up of high concentration PV-solar technology and micro-CHP devices. Proceedings

of the International Solar Energy Conference EUROSUN 2012. Rijeka (Croatia), Settembre 2012, ISBN: 978-953-6886-20-3.

57. Brandoni C, Renzi M, Caresana F, Polonara F. Optimization of hybrid micro-cchp systems in the day-ahead electricity market. International COnfernce Microgen III, April 2013, Napoli, Italy.
58. Di Buò G, Ippoliti G, Renzi M, Pirro M, Longhi S, Sileoni S. CSP control system implementation on embedded board. International Conference on Clean Electric Power conference (ICCEP), June 2013, Cagliari, Italy.
59. Prando D, Renzi M, Gasparella A, Baratieri M. Experimental and modeling analysis of a biomass chp generation system with district heating: a study case in south-tyrol. 21st European Biomass Conference and Exhibition (EU BC&E), Copenhagen, Denmark, 3-7 June 2013.
60. Renzi M, Santolini M, Costantini L, Mandolini A. Experimental measurement of the performance of a small scale heliostat plant. Proceedings of the extended abstracts of the EUROTHERM seminar No. 98 Concentrating Solar Energy Systems, TU Wien, Austria, July 4-5 2013.
61. Prando D, Renzi M, Gasparella A, Baratieri M. Experimental and modeling analysis of a urban settlement supplied by a district heating system based on biomass: a study case in south-tyrol. International Conference on Cleantech for Smart Cities and Building: from nano to urban scale (CISBAT), Lausanne, Switzerland, 4-6 September 2013
62. Renzi M, Santolini M, Comodi G. Performance analysis of a 3.5 kWp CPV system with two axis tracking. International Conference on Applied Energy (ICAE 2014), June 2014, Taipei, Taiwan.
63. Egidi L, Renzi M, Comodi G. Effect of the secondary optics and the receiver design on the performance of a triple junction solar cell. In: Proceedings of the 7th International Conference on Applied Energy (ICAE 2015). Abu Dhabi, 28-31 March 2015.
64. Comodi G, Renzi M, Caresana F, Pelagalli L. Limiting the effect of ambient temperature on micro gas turbine performance through inlet air cooling techniques: an experimental comparison between fogging and direct expansion. In: Proceedings of the 7th International Conference on Applied Energy (ICAE 2015). Abu Dhabi, 28-31 March 2015.
65. Renzi M, Brandoni C. Influence of the optimal storage tank capacity on the economy of hybrid PV micro-CHP systems, The 3rd Sustainable Thermal Energy Management Conference (SusTEM 2015). Newcastle upon Tyne, 7-8 July 2015.
66. Renzi M, Riolfi C, Baratieri M. Influence of the syngas feed on the combustion process and performance of a micro gas turbine with steam injection. In: Proceedings of the 8th International Conference on Applied Energy (ICAE 2016). Beijing International Convention Center. Beijing, Cina, 8-11 October 2016.
67. Renzi M, Egidi L, Cioccolanti L, Comodi G. Performance simulation of a small scale heliostat CSP system: case studies in Italy. In: Proceedings of the 8th International Conference on Applied Energy (ICAE 2016). Beijing International Convention Center. Beijing, Cina, 8-11 October 2016.
68. Renzi M, Caligiuri C, Rossi M. Micro-gas turbine feed with natural gas and synthesis gas: variation of the turbomachines' operative conditions with and without steam injection. In: proceedings of the ASME International Turbomachinery Technical Conference & Exposition (TURBO EXPO 2017). Charlotte Convention Center. Charlotte (NC), USA, 26-30 June 2017.
69. Rossi M, Renzi M. Analytical prediction models for evaluating Pumps-as-Turbines (PaTs) performance. In: Conference Proceeding of the 2nd International Conference on Advances on Clean Energy Research ICACER 2017. Berlin, Germania, 7-9 April 2017.
70. Caligiuri C, Antolini D, Patuzzi F, Renzi M, Baratieri M. Modelling of a small scale energy conversion system based on an open top gasifier coupled with a dual fuel diesel engine. In: Proceedings of the 25th

European Biomass Conference and Exhibition. Stockholm, Svezia, 12-15 June 2017.

71. Caligiuri C, Renzi M, Baratieri M. Development of a 0D thermodynamics combustion simulation tool for a dual fuel diesel-producer gas engine. In: Digital Proceedings of the European Combustion Meeting 2017. Rijeka, Croazia, 18-21 April 2017.
72. Bietresato M, Renzi M, Mazzetto F. A different approach to limit the pollutants' emissions of agricultural engines. In: Proceedings of the 11th International AIIA Conference, Biosystems Engineering addressing the human challenges of the 21st century. Bari, Italia, 5-8 July 2017.
73. Vakalis S, Caligiuri C, Moustakas K, Malamis D, Renzi M, Baratieri M. Modelling the emissions of a dual fuel engine coupled with a biomass gasifier – Supplementing the Wiebe model. In: Proceedings of the 5th International Conference on Sustainable Solid Waste Management. Athens, Grecia, 21-24 June 2017.
74. Caligiuri C, Renzi M. Combustion modelling of a dual fuel diesel – producer gas compression ignition engine. In: Proceedings of the 9th International Conference on Applied Energy (ICAE 2017). Cardiff, UK, 21-25 August 2017.
75. Carducci F, Giovannelli A, Renzi M, Comodi G. Improving flexibility of industrial microgrids through thermal storage and HVAC management strategies. In: Proceedings of the 9th International Conference on Applied Energy (ICAE 2017). Cardiff, UK, 21-25 August 2017.
76. De Paepe W, Renzi M, Montero Carrero M, Caligiuri C, Contino F. Micro gas turbine cycle humidification for increased flexibility: numerical and experimental model validation, ASME Turbo Expo Conference and Exposition, 11-15 June 2018, Oslo, Norway. Paper No. GT2018-76696, pp. V003T06A018; 13 pages, DOI:10.1115/GT2018-76696 (2018).
77. Renzi M, Rossi M. A generalized theoretical methodology to forecast flow coefficient, head coefficient and efficiency of Pumps-as-Turbines (PaTs). 10th International Conference on Applied Energy, ICAE 2018, 22-25 August 2018, Hong Kong, China. (*)
78. Rossi M, Nigro A, Renzi M. A predicting model of PaTs performance in off-design operating conditions. 10th International Conference on Applied Energy, ICAE 2018, 22-25 August 2018, Hong Kong, China.
79. Renzi M, Rudolf P, Štefan D, Nigro A, Rossi M. Energy recovery in oil refineries through the installation of axial Pumps-as-Turbines (PaTs) in a wastewater sewer: a case study. 10th International Conference on Applied Energy, ICAE 2018, 22-25 August 2018, Hong Kong, China. (*)
80. Rossi M, Nigro A, Pisaturo GR, Renzi M. Technical and economic analysis of Pumps-as-Turbines (PaTs) used in an Italian Water Distribution Network (WDN) for electrical energy production. 10th International Conference on Applied Energy, ICAE 2018, 22-25 August 2018, Hong Kong, China.
81. Caligiuri C, Bietresato M, Renzi M. Fuel feed pumps Practical problems in using diesel-biodiesel-bioethanol blends in internal combustion engines. 10th International Conference on Applied Energy, ICAE 2018, 22-25 August 2018, Hong Kong, China.
82. Bietresato M, Caligiuri C, Renzi M, Mazzetto F. Use of diesel-biodiesel-bioethanol blends in farm tractors: first results obtained with a mixed experimental-numerical approach. 10th International Conference on Applied Energy, ICAE 2018, 22-25 August 2018, Hong Kong, China.
83. Alberizzi JC, Rossi M, Renzi M. Optimal sizing of an off-grid hybrid photovoltaic–wind system with battery storage for a mountain lodge in south-tyrol using a mixed integer linear programming (MILP) algorithm. Proceedings of ICEER2019 - 6th International Conference on Energy and Environment Research: "Energy and environment: challenges towards circular economy", Lisbon (Portugal), 22-25 July 2019.

Articles presented in **national conferences with scientific committee**

review:

84. Caresana F, Comodi G, Pelagalli L, Renzi M, Vagni S. Mappatura ed analisi di sensibilità in funzione delle grandezze ambientali di una microturbina Turbec T100. 65° Convegno Nazionale Associazione Termotecnica Italiana (ATI), Cagliari, Settembre 2010. Pubblicazione 04-281 ISBN 8890411632.
85. Bartolini CM, Cioccolanti L, Comodi G, Renzi M. Utilizzo di un cogeneratore Stirling su imbarcazioni da diporto per la produzione combinata di elettricità ed acqua dissalata. 65° Convegno Nazionale Associazione Termotecnica Italiana (ATI), Cagliari, Settembre 2010. Pubblicazione 04-307, ISBN 8890411632.
86. Di Nicola G, Di Nicola G, Polonara F, Renzi M, Di Prato G. Proprietà termofisiche di un nuovo refrigerante: R1234yf. 65° Convegno Nazionale Associazione Termotecnica Italiana (ATI), Cagliari, Settembre 2010. Pubblicazione 05-220, ISBN 8890411632.
87. Rossi M, Righetti M, Renzi M. Pump-as-Turbine for energy recovery applications: the case study of an aqueduct. In Proceedings of the 71st Conference of the Italian Thermal Machines Engineering Association (ATI2016), Turin, Italia, 14-16 September 2016.
88. Alberizzi JC, Renzi M, Nigro A, Rossi M. Study of a Pump-as-Turbine (PaT) speed control for a Water Distribution Network (WDN) in South-Tyrol subjected to high variable water flow rates. In Proceedings of the 73rd Conference of the Italian Thermal Machines Engineering Association (ATI2018), Pisa, Italia, 12-14 September 2018.
89. Rossi M, Comodi G, Piacente N, Renzi M. Effects of viscosity on the performance of Hydraulic Power Recovery Turbines (HPRTs) by the means of Computational Fluid Dynamics (CFD) simulations. In Proceedings of the 73rd Conference of the Italian Thermal Machines Engineering Association (ATI2018), Pisa, Italia, 12-14 September 2018.
90. Nicolosi FF, Renzi M. Effect of the Regenerator Efficiency on the Performance of a Micro Gas Turbine Fed with Alternative Fuels. In Proceedings of the 73rd Conference of the Italian Thermal Machines Engineering Association (ATI2018), Pisa, Italia, 12-14 September 2018.

Technical reports:

91. Hawkes A D, Brandoni C, Tzscheutschler P, Rosato A, Sibilio S, Angrisani G, Roselli C, Sasso M, Tariello F, Renzi M, Polonara F, Caresana F, Johnson G, Morrison IB, Entchev E, Ghobar M, Lee EJ, Anindito S, Anindito S, Zapata Riveros J, Engeland JV, Donceel R, D'haeseleer W, Shimoda Y, Aoki T, Sakonji T. Impact of Support Mechanisms on Microgeneration Performance in OECD Countries: a Report of Annex 54 "Integration of Micro-Generation and Related Energy Technologies in Buildings". International Energy Agency 2014.
92. Sasso M, Angrisani G, Roselli C, Tariello F, Rosato A, Sibilio S, Lee EJ, Kang EC, Cho S, Entchev E, Ghobar M, Lombardi K, Ribberink H, Yang L, Brandoni C, Renzi M, Mastrucci A, Caresana F, Polonara F, Shimoda Y, Aoki T. Synthesis Report on the Viability of Micro-Generation Systems in Different Operational Contexts: a Report of Annex 54 "Integration of Micro-Generation and Related Energy Technologies in Buildings". International Energy Agency 2014.

Further data

I have been the **presenting author in the last years in international conferences** of the following works:

- International Conference on Applied Energy (ICAE 2014) presenting the work:
    - *Performance analysis of a 3.5 kWp CPV system with two axis tracking*

  on the 01/06/2014 at the National Taiwan University of Science and Technology

- International Conference on Applied Energy (ICAE 2015) presenting the work:
  - *Effect of the secondary optics and the receiver design on the performance of a triple junction solar cell*

  on the 29/03/2015 at the Abu Dhabi National Exhibition Centre

- The 3rd Sustainable Thermal Energy Management Conference (SusTEM 2015) presenting the work:
  Influence of the optimal storage tank capacity on the economy of hybrid PV micro-CHP systems
  on the 07/07/2015 at the conference room of the Newcastle Marriott Hotel Gosforth Park

- International Conference on Applied Energy (ICAE 2016) presenting the works:
  - *Influence of the syngas feed on the combustion process and performance of a micro gas turbine with steam injection*
  - *Performance simulation of a small scale heliostat CSP system: case studies in Italy*

  on the 10/10/2016 at the Beijing International Convention Center

- ASME International Turbomachinery Technical Conference & Exposition (TURBO EXPO 2017) presentando il seguente contributo:
  - *Micro-gas turbine feed with natural gas and synthesis gas: variation of the turbomachines' operative conditions with and without steam injection*

  on the 30/06/2017 at the Charlotte Convention Center, Charlotte (NC), USA

- International Conference on Applied Energy (ICAE 2017) presenting the work:
  - *A 0D Thermodynamics combustion simulation tool for a dual fuel diesel – producer gas compression ignition engine*

  on the 24/08/2017 at the University of Cardiff, Galles, UK.

- International Conference on Applied Energy (ICAE 2018) presenting the work:
  - *A generalized theoretical methodology to forecast flow coefficient, head coefficient and efficiency of Pumps-as-Turbines (PaTs)*
  - *Energy recovery in oil refineries through the installation of axial Pumps-as-Turbines (PaTs) in a wastewater sewer: a case study on the 22th-25th August 2018, Hong Kong, China.*

- International Conference on Applied Energy (ICAE 2019) presenting the work:
  - *Rossi M, Comodi G, Piacente N, Renzi M. Energy recovery in an italian oil refinery by means of a hydraulic power recovery turbine (hprt) installed in a H_2S removal process. International Conference on Applied Energy 2019, Aug 12-15, 2019, Västerås, Sweden, Paper ID: 0023.*

Entrepreneurship

Since January 2011, I am **shareholder of the society STRATEGIE srl which is an academic spin-off of the Polytechnic University of Marche**, with 5.5% of the shares. Within the company, I was responsible for the development of innovative solar concentration systems. The projects received funds from two major companies in the sector of energy systems for a total of € 520,000 in order to develop systems based on concentrated solar power. To this purpose, a start-up company, called ISIDE srl (controlled by the spin-off STRATEGIE srl), was founded (I am one of the co-funders). The start-up has developed and brought to

industrialization two innovative solutions in the field of solar thermal and photovoltaic technology.
During the collaboration at the spin-off Company, I have studied and designed several innovative tracking systems that combine lightweight of the structure and high solar tracking accuracy.
The patents deriving from this work are reported hereinafter:

- Inseguitore solare e relativa batteria di inseguitori (N. ITAN2009 0067 del 29/03/2011; N. WO2011036290 on the 31/03/2011 converted to utility model GE2013U000023)
- Sistema di gestione individualizzata di una pluralità di motori passo-passo (N. ITAN2009 0068 on the 29/03/2011 converted to utility model GE2013U000022)
- Dispositivo di inseguimento solare e concentrazione per celle fotovoltaiche (N. ITAN20130094 del 16/11/2014; N. WO2014184815 on the 20/11/2014)
- Procedimento di connessione di un ricevitore fotovoltaico ad un relativo supporto (N. ITAN20130093 on the 16/11/2014)
- Convertitore fotovoltaico a concentrazione della radiazione solare (N. ITAN20130091/2 on the 16/11/2014)

Language competence

Mother language: **Italian**
Other languages:

- **English: C1 level certified** (Certificate of Advanced English, July 2014; copy of the certificate is attached)
- **German: B2 level certified** (ÖSD Prüfung, July 2016; copy of the certificate is attached)

Bolzano, 26/02/2020

Signature

Massimiliano Renni