

Curriculum Vitae

INFORMAZIONI PERSONALI

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FORMAZIONE TITOLI

Education and Qualifications

2026: Italian National Scientific Qualification for the Position of Associate Professor, Academic Recruitment Field: 09/IIND-07 - Thermal Engineering and Nuclear Engineering, Scientific-Disciplinary Sector: IIND-07/A - Thermal Engineering and Industrial Energy Systems.

2014-2017: PhD in Energy Science and Engineering (29th cycle), University of Naples "Parthenope", Italy. Doctoral research conducted in collaboration with the Istituto Motori of the Italian National Research Council (CNR), Naples, Italy. Supervisors: Prof. Nicola Massarotti and Dr Michela Costa.

2013: MSc in Mechanical Engineering, summa cum laude, University of Palermo, Italy

ATTIVITA' DIDATTICA

Teaching Appointments, Including within Ministerially Accredited Doctoral Programmes

Innovative Applications of Heat Pumps in Renewable Energy Systems

Teaching appointment within the PhD Programme in Energy, 15th cycle, Department of Engineering, University of Palermo, academic year 2024/2025. The course was delivered exclusively to PhD candidates and was included as a regular course in the programme's official curriculum.

Position held: Fixed-term Researcher, Type A (RTD-A), Department of Engineering, University of Palermo.

Period: 19 June 2025

Industrial Applications of Renewable Energy

Teaching appointment for the course "Industrial Applications of Renewable Energy", within the Bachelor's Degree Programme in Energy and Renewable Energy Engineering at the University of Palermo, academic years 2024/2025 and 2025/2026.

Position held: Fixed-term Researcher, Type A (RTD-A), Department of Engineering, University of Palermo.

Period: 23 September 2024-28 February 2026

RICERCHE FINANZIATE

Leadership of, or Participation in, Research Groups with National or International Collaborations

CNR Institute of Engines–LaTEP Research Collaboration

Participation in the research group of the Institute of Engines of the Italian National Research Council (CNR-IM), Naples, within its collaboration with the Laboratoire de Thermique, Énergétique et Procédés (LaTEP), Université de Pau et des Pays de l'Adour, Pau, France. The research focused on the modelling of biomass thermochemical conversion processes and was supervised by Dr Michela Costa (CNR-IM) and Prof. Frédéric Marias (LaTEP).

Role/position: PhD student at the University of Naples "Parthenope".

Research outputs:

La Villetta M., Marias F., Costa M., Massarotti, N. A one-dimensional model for RDF thermochemical conversion on a moving grate of a full-scale incineration plant. 28th International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems (ECOS 2015), 30 June-3 July 2015, Pau, France. <https://hdl.handle.net/20.500.14243/294540>

Period: 4 November 2015-28 February 2016.

WORTH-IT Project – International Research Collaboration

Participation in the research group of the CNR Institute of Engines (CNR-IM), Naples, within its collaboration with National Ilan University, Taiwan, under the project "Waste Heat Recovery through Traditional or Organic Rankine Cycle from Rice Husk Incineration: A Modelling Approach for Increasing Energy Efficiency (WORTH-IT)". The activity was supervised by Dr Michela Costa (CNR-IM) and Prof. C. T. Chang (National Ilan University), and the collaboration also involved the University of Naples "Parthenope" and the University of Cassino and Southern Lazio.

Role/position: R&D Manager and Project Manager at Costruzioni Motori Diesel (CMD) S.p.A.

Research outputs:

Chang C. T., Costa M., La Villetta M., Macaluso A., Piazzullo D., Vanoli L. (2019). Thermoeconomic analyses of a Taiwanese combined CHP system fuelled with syngas from rice husk gasification. Energy, 167, 766–780. <https://doi.org/10.1016/j.energy.2018.11.012>

Period: 16 December 2015-23 December 2017.

INNOVARE Project – National Research Group

Participation in a research group comprising the CNR Institute of Engines (CNR-IM), Naples; the University of Rome “Tor Vergata”; the University of Naples “Federico II”; the University of Naples “Parthenope”; and the University of L’Aquila, within the project “Innovative Plants for Distributed Polygeneration from Residual Biomass (INNOVARE)”. Funding reference: Horizon 2020 – PON Enterprises and Competitiveness 2014–2020; Decree No. 4700 of 20 November 2017; Project No. F/050495/03/X32; project period 2017–2020.

Role/position: R&D Manager and Project Manager at Costruzioni Motori Diesel (CMD) S.p.A.

Research outputs:

- Caputo C., Cirillo D., Costa M., La Villetta M., Tuccillo R., Villani R. (2018). Numerical analysis of a combined heat and power generation technology from residual biomasses. *Journal of Energy and Power Engineering*, 12, 300–321. <https://doi.org/10.17265/1934-8975/2018.06.003>
 - Costa M., Rocco V., Caputo C., Cirillo D., Di Blasio G., La Villetta M., Martoriello G., Tuccillo R. (2019). Model-based optimization of the control strategy of a gasifier coupled with a spark-ignition engine in a biomass-powered cogeneration system. *Applied Thermal Engineering*, 160, 114083. <https://doi.org/10.1016/j.applthermaleng.2019.114083>
 - Costa M., Di Blasio G., Prati M. V., Costagliola M. A., Cirillo D., La Villetta M., Caputo C., Martoriello G. (2020). Multi-objective optimization of a syngas-powered reciprocating engine equipping a combined heat and power unit. *Applied Energy*, 275, 115418. <https://doi.org/10.1016/j.apenergy.2020.115418>
 - Costa M., Buono A., Caputo C., Carotenuto A., Cirillo D., Costagliola M. A., Di Blasio G., La Villetta M., Macaluso A., Martoriello G., Massarotti, N., Mauro A., Migliaccio M., Mulone V., Murena F., Piazzullo D., Prati M. V., Rocco V., Stasi A., Vanoli L., Cinocca A., Di Battista D., De Vita A. (2020). The INNOVARE Project: Innovative plants for distributed polygeneration by residual biomass. *Energies*, 13, 4020. <https://doi.org/10.3390/en13154020>
 - Cirillo D., Di Palma M., La Villetta M., Macaluso A., Mauro A., Vanoli, L. (2021). A novel biomass gasification micro-cogeneration plant: Experimental and numerical analysis. *Energy Conversion and Management*, 243, 114349. <https://doi.org/10.1016/j.enconman.2021.114349>
- Period: 1 July 2017–15 July 2020.

PROMETEO Project – CNR-IM and University of Naples “Parthenope”

Participation in the research group of the CNR Institute of Engines (CNR-IM), Naples, in collaboration with the University of Naples “Parthenope”, within the project “Production of Electrical, Thermal and Cooling Energy through a Residual-Biomass-Fuelled Micro-Cogeneration Unit (PROMETEO)”. Funding reference: Major R&D Projects – PON Enterprises and Competitiveness ERDF 2014–2020 - Sustainable Industry; Decree No. 2531 of 3 August 2018; Project No. F/090045/01-02/X36; project period 2017–2020.

Role/position: R&D Manager and Project Manager at Costruzioni Motori Diesel (CMD) S.p.A.

Research outputs:

- Costa M., La Villetta M., Piazzullo D., Cirillo D. (2021). A phenomenological model of a downdraft biomass gasifier flexible to the feedstock composition and the reactor design. *Energies*, 14, 4226. <https://doi.org/10.3390/en14144226>
- Period: 2 October 2017–2 October 2021.

SOSPURI Project – University of Campania “Luigi Vanvitelli”

Participation in the research group of the University of Campania “Luigi Vanvitelli”, Caserta, within the SOSPURI project. Funding reference: European Union – NextGenerationEU, National Recovery and Resilience Plan (NRRP), Mission 2 – Green Revolution and Ecological Transition, Component 2 – Renewable Energy, Hydrogen, Grid and Sustainable Mobility; CUP: F29J22001310004; project period 2022–2025.

Role/position: R&D Manager and Project Manager at Costruzioni Motori Diesel (CMD) S.p.A.

Research outputs:

- Morrone B., Bracciano P., Cirillo D., La Villetta M., Caputo C. (2025). Exergy and economic analysis of a micro-cogeneration system coupled with a biomass gasifier. *Renewable Energy*, 244, 122574. <https://doi.org/10.1016/j.renene.2025.122574>
- Period: 27 June 2022–28 February 2023.

NEST Project – Spoke 7: Smart Sector Integration

Participation in a research group comprising the University of Palermo; the University of Naples “Federico II”; the University of Bologna; the University of Genoa; the Polytechnic University of Bari; the Polytechnic University of Turin; and ENEA, within the project “Network 4 Energy Sustainable Transition (NEST)”, Spoke 7: Smart Sector Integration. Funding reference: NEST Extended Partnership, Topic 2 – Future Energy Scenarios, Subtopic 2.A – Green Energies of the Future; Project code: PE0000021; CUP: B73C22001280006; project period 2022–2025. The project was funded by the European Union – NextGenerationEU under the National Recovery and Resilience Plan (NRRP).

Role/position: Fixed-term Researcher, Type A (RTD-A), pursuant to Article 24(3)(a) of Italian Law No. 240 of 30 December 2010; Academic Recruitment Field 09/C2 – Thermal Engineering and Nuclear Engineering; Scientific-Disciplinary Sector ING-IND/10 – Industrial Thermal Engineering; Department of Engineering, University of Palermo.

Research outputs:

- Catrini P., Testasecca T., La Villetta M., Morale M., Piacentino A. (2023). Thermodynamic-based method for supporting design and operation of thermal grids in the presence of distributed energy producers. *Journal of Sustainable Development of Energy, Water and Environment Systems*, 11(3), 1110459. <https://doi.org/10.13044/j.sdewes.d11.0459>
- Ala G., Catrini P., Ippolito M. G., La Villetta M., Licciardi S., Musca R., Piacentino A., Riva Sanseverino E., Samadi H. (2023). Deep learning for smart grid and energy context. In 2023 Asia Meeting on Environment and Electrical Engineering (EEE-AM) (pp. 1–6). IEEE. <https://doi.org/10.1109/EEE-AM58328.2023.10447021>
- Ala G., Catrini P., Ippolito M. G., La Villetta M., Licciardi S., Musca R., Piacentino A., Riva Sanseverino E. (2023). A workflow for thermal and electrical co-simulation of energy systems. In 2023 Asia Meeting on Environment and Electrical Engineering (EEE-AM) (pp. 1–6). IEEE. <https://doi.org/10.1109/EEE-AM58328.2023.10394689>

- Licciardi S., La Villetta M., Ala G., Francomano E., Catrini P., Musca R., Piacentino A., Riva Sanseverino E., Samadi H. (2024). Long short-term memory neural network and energy applications in the smart grid framework. In 2024 IEEE 8th Forum on Research and Technologies for Society and Industry Innovation (RTSI) (pp. 36–41). IEEE. <https://doi.org/10.1109/RTSI61910.2024.10761755>

- La Villetta M., Catrini P., Piacentino A. (2025). Dynamic simulation of a heat pump for building applications oriented to assess the potential for demand response and ancillary services supply. *Energy and Buildings*, 344, 116006. <https://doi.org/10.1016/j.enbuild.2025.116006>

Period: 1 November 2022–28 February 2026.

INCARICHI / CONSULENZE

Position

2026-present: Research Fellow in Industrial Thermal Engineering, Department of Engineering, University of Palermo, Italy. Position funded within the STORM Project - Interreg NEXT MED Programme 2021-2027. Research topic: "Design and Management of a Trigeneration System with Underground Thermal Energy Storage". Project code: PRJ-2119; CUP: B73C25000560007, Scientific Lead: Prof. Fabio Cardona.

2023-2026: Fixed-term Researcher, Type A (RTD-A), in Industrial Thermal Engineering, Department of Engineering, University of Palermo, Italy. Position funded within the "Network 4 Energy Sustainable Transition - NEST" Project, Spoke 7: Smart Sector Integration. Project code PE0000021, CUP: B73C22001280006. Scientific Lead: Prof. Maurizio Cellura, Supervisor: Prof. Antonio Piacentino.

2023-2026: Assistant Professor on a fixed-term contract, Type A (RTD-A), Italian Academic Discipline Code: IIND-07/A - Thermal Engineering and Industrial Energy Systems. Department of Engineering, University of Palermo, Italy.

2017-2023: R&D and Project Manager, Energy Department-Energy Business Unit, Costruzioni Motori Diesel (CMD) S.p.A., San Nicola La Strada, Caserta, Italy.

PUBBLICAZIONE

Publications in International Journals

1. La Villetta M., Catrini P., Piacentino A., Exploring the flexibility potential of office building with air-to-water heat pumps in the Mediterranean climate, *Energy Conversion and Management*, Volume 366, 2026, 121856, <https://doi.org/10.1016/j.enconman.2026.121856>
2. La Villetta M., Piazzullo D., Catrini P., Piacentino A. Costa M. 3E analysis of a combined photovoltaic plant and biomass-fueled trigeneration system for an apartment building operating under the Collective Self-Consumption scheme. *Energy*, Volume 342, 2026, 139692, ISSN 0360-5442, <https://doi.org/10.1016/j.energy.2025.139692>
3. La Villetta M., Catrini P., Piacentino A., Dynamic simulation of a heat pump for building applications oriented to assess the potential for demand response and ancillary services supply, *Energy and Buildings*, Volume 344, 2025, <https://doi.org/10.1016/j.enbuild.2025.116006>
4. Catrini P., La Villetta M., Piacentino A. Energy flexibility assessment of commercial buildings in cooling season based on advanced modeling of rooftop units. *Applied Thermal Engineering*, Volume 279, Part A, 2025. <https://doi.org/10.1016/j.applthermaleng.2025.127511>
5. Dino G. E., Catrini P., La Villetta M., Piacentino A. (2025). A techno-economic analysis of a high vacuum solar system integrated into a prosumer-based district heating network. *ENERGY*, vol. 330, ISSN: 0360-5442, doi: 10.1016/j.energy.2025.136843
6. Testasecca T., Catrini P., La Villetta M., Beccali M., Piacentino A. (2025). Energy assessment of thermal solar-powered district heating and cooling networks for a cluster of buildings in Mediterranean climate. *Renewable Energy*, vol. 251, 123397, ISSN: 1879-0682, doi:10.1016/j.renene.2025.123397
7. B. Morrone, P. Bracciano, D. Cirillo, M. La Villetta, C. Caputo. Exergy and economic analysis of a micro cogeneration system coupled with a biomass gasifier. *Renewable Energy*, Volume 244. 2025, 122574, ISSN 0960-1481, doi:10.1016/j.renene.2025.122574
8. Jafarholi H., Catrini P., Munith Kumar D., La Villetta M., Panno D. (2024). Mapping the performance of reversible air-to-water heat pump for improving energy savings estimation in energy flexibility scenarios. *Energy Conversion and Management*, vol. 315, 118762, ISSN: 0196-8904, doi: 10.1016/j.enconman.2024.118762
9. Catrini P., La Villetta M., Kumar D. M., Morale M., Piacentino A. (2024). Analysis of the operation of air-cooled chillers with variable-speed fans for advanced energy-saving-oriented control strategies. *Applied Energy*, vol. 367, 123393, ISSN: 0306-2619, doi: 10.1016/j.apenergy.2024.123393
10. Catrini P., Testasecca T., La Villetta M., Morale M., Piacentino A., Thermodynamic-based method for supporting design and operation of thermal grids in presence of distributed energy producers, *J.sustain. dev. energy water environ. syst.*, 11(3), 1110459, 2023, doi:10.13044/j.sdewes.d11.0459
11. Petrillo A., Travaglini M., Di Fraia S., Vanoli L., Cirillo D., La Villetta M.. Experimental study and Life Cycle Assessment of biomass small-scale trigeneration plant. Elsevier, *Journal of Cleaner Production* 2021;326:129234, doi:10.1016/j.jclepro.2021.129234
12. Cirillo D., Di Palma M., La Villetta M., Macaluso A., Mauro A., Vanoli L. A novel biomass gasification microcogeneration plant: experimental and numerical analysis. Elsevier, *ECM* 2021;243:114349, doi:10.1016/j.enconman.2021.114349
13. Costa M., La Villetta M., Piazzullo D., Cirillo D. Phenomenological Model of a Downdraft Biomass Gasifier Flexible to the Feedstock Composition and the Reactor Design. *Energies*, *Applied Energy* 2021;14:4226, doi:10.3390/en14144226
14. Costa M., Massarotti N., Stasi A., Cirillo D., La Villetta M., Di Blasio G., Prati M.V., Costagliola M.A., Mauro A., Vanoli L., Macaluso A., Carotenuto A., Migliaccio M., Buono A., Mulone V., Rocco V., Caputo C., Martoriello G. The INNOVARE Project: Innovative plant for distributed poly-generation by residual biomass. *MDPI, Energies* 2020;13:4020. doi:10.3390/en13154020

15. Costa M., Di Blasio G., Prati M. V., Costagliola M. A., Cirillo D., La Villetta M., Caputo C., Martoriello G. Multi-objective optimization of a syngas powered reciprocating engine equipping a biomass powered CHP unit. Elsevier, Applied Energy 2020;275:115418.doi.org/10.1016/j.apenergy.2020.115418
16. D. Sofia, N. Lotrecchiano, D. Cirillo, M. Costa, M. La Villetta. Environmental impact analysis of flue gases emissions for a 20 kWe biomass gasifier. AIDC, Chemical Engineering Transactions 2020;80:295-300.doi:10.3303/CET2080050
17. C. Caputo, D. Cirillo, M. Costa, M. La Villetta, G. Martoriello, D. Piazzullo, R. Tuccillo. Optimization of the Efficiency in a Syngas Powered SI Engine through Numerical Studies related to the Geometry of the Combustion Chamber. AIDC, Chemical Engineering Transactions 2020;80:19-24.doi.org/10.3303/CET2080004
18. E. Stasi, A. Giuri, M. La Villetta, D. Cirillo, G. Guerra, A. Maffezzoli, E. Ferraris, C.E. Corcione. Development and characterization of innovative carbon-based waste ashes/epoxy composites. Elsevier, Materials Today: Proceedings 2021;34:133-139.doi.org/10.1016/j.matpr.2020.01.492
19. M. Costa, V. Rocco, C. Caputo, D. Cirillo, G. Di Blasio, M. La Villetta, G. Martoriello, R. Tuccillo. Model based optimization of the control strategy of a gasifier coupled with a spark ignition engine in a biomass powered cogeneration system. Elsevier, Applied Thermal Engineering 2019; 160:114083. doi.org/10.1016/j.applthermaleng.2019.114083
20. E. Stasi, A. Giuri, M. La Villetta, D. Cirillo, G. Guerra, A. Maffezzoli, E. Ferraris, C.E. Corcione. Catalytic Activity of Oxidized Carbon Waste Ashes for the Crosslinking of Epoxy Resins. MDPI, Polymers 2019;11(6),1011. doi.org/10.3390/polym11061011
21. M. Costa, D. Cirillo, V. Rocco, R. Tuccillo, M. La Villetta, C. Caputo, G. Martoriello. Characterization and Optimization of Heat Recovery in a Combined Heat and Power Generation Unit. TECNICA ITALIANA-Italian Journal of Engineering Science 2019;63:447-451. doi.org/10.18280/ti-ijes.632-448
22. C.T. Chang, M. Costa, M. La Villetta, A. Macaluso, D. Piazzullo, L. Vanoli. Thermo-economic analyses of a Taiwanese combined CHP system fuelled with syngas from rice husk gasification. Elsevier, Energy 2019;167:766-780. doi.org/10.1016/j.energy.2018.11.012
23. C. Caputo, D. Cirillo, M. Costa, M. La Villetta, R. Tuccillo, R. Villani. Numerical Analysis of a Combined Heat and Power Generation Technology from Residual Biomasses. Journal of Energy and Power Engineering 2018;12:300-321. doi: 10.5071/26thEUBCE2018-ICO.8.3
24. M. La Villetta, M. Costa, D. Cirillo, N. Massarotti, L. Vanoli. Performance analysis of a biomass powered micro-cogeneration system based on gasification and syngas conversion in a reciprocating engine. Elsevier, Energy Conversion and Management 2018;175:33-48. doi.org/10.1016/j.enconman.2018.08.017
25. D. Cirillo, M. Costa, M. La Villetta, Z. Petranovic, D. Piazzullo, M. Vujanovici. CFD modelling of spark ignition internal combustion engine fuelled with syngas for mCHP system. AIDC, Chemical Engineering Transactions 2018;65:13-18. doi.org/10.3303/CET1865003
26. M. Costa, M. La Villetta, N. Massarotti. Modelling approaches to biomass gasification: a review with emphasis on the stoichiometric method. Elsevier, Renewable & Sustainable Energy Reviews 2017;74:71-88. dx.doi.org/10.1016/j.rser.2017.02.027
27. M. Costa, M. La Villetta, N. Massarotti, D. Piazzullo, V. Rocco. Numerical analysis of a compression ignition engine powered in the dual-fuel mode with syngas and biodiesel. Elsevier, Energy 2017;137:969-979. dx.doi.org/10.1016/j.energy.2017.02.160
28. M. Costa, U. Sorge, S. Merola, A. Irimescu, M. La Villetta, V. Rocco. Split injection in a Homogeneous stratified gasoline direct injection engine for high combustion efficiency and low pollutants emission. Elsevier, Energy 2016;117:405-415. dx.doi.org/10.1016/j.energy.2016.03.065
29. M. Costa, M. La Villetta, N. Massarotti. Optimal Tuning of a Thermo-Chemical Equilibrium Model for Downdraft Biomass Gasifiers. AIDC, Chemical Engineering Transactions 2015;43:439-444. doi:10.3303/CET1543074.

Publications in International Conference Proceedings

1. G. Ala, S. Licciardi, M. La Villetta, P. Catrini, R. Musca, A. Piacentino, E. Riva Sanseverino, M.G. Ippolito, H. Samadi, "Deep Learning for Smart Grid and Energy Context," 2023 Asia Meeting on Environment and Electrical Engineering (EEE-AM), Hanoi, Vietnam, 2023, pp. 1-6. doi: 10.1109/EEE-AM58328.2023.10447021
2. S. Licciardi, M. La Villetta, G. Ala, E. Francomano, P. Catrini, R. Musca, A. Piacentino, E. Riva Sanseverino, H. Samadi, "Long Short Term Memory Neural Network and Energy Applications in the Smart Grid Framework," 2024 IEEE 8th Forum on Research and Technologies for Society and Industry Innovation (RTSI), Milano, Italy, 2024, pp. 36-41. doi: 10.1109/RTSI61910.2024.10761755
3. Ala G., Catrini P., Ippolito M.G., La Villetta M., Licciardi S., Musca R., Piacentino A., Riva Sanseverino E. A Workflow for Thermal and Electrical Co-Simulation of Energy Systems, 2023. Asia Meeting on Environment and Electrical Engineering (EEE-AM), Hanoi, Vietnam, 2023, pp. 1-6. doi: 10.1109/EEE-AM58328.2023.10394689
4. M. Costa, G. Di Blasio, M. V. Prati, M. A. Costagliola, D. Cirillo, M. La Villetta, C. Caputo, G. Martoriello. The effects of the EGR and principal engine operating condition on the emissions for a syngas powered engine: from the numerical simulation to the experimental results. 14th Conference on sustainable development of energy, water and environment systems". October 1-6, 2019, Dubrovnik, Croatia.
5. M. Costa, N. Massarotti, A. Stasi, D. Cirillo, M. La Villetta, G. Di Blasio, M.V. Prati, M.A. Costagliola, A. Mauro, L. Vanoli, A. Macaluso, A. Carotenuto, M. Migliaccio, A. Buono, V. Mulone, V. Rocco, C. Caputo, G. Martoriello. Innovative plant for distributed poly-generation by residual biomass. Proceedings of 27th European Conference and Exhibition. May 27-30, 2019, Lisbon, Portugal.
6. M. Costa, G. Di Blasio, M.V. Prati, M.A. Costagliola, G. Ruoppolo, M. Urciuolo, D. Cirillo, M. La Villetta, V. Rocco, C. Caputo, R. Tuccillo, G. Martoriello. Experimental comparison on real m – CHP fuelled by different bio-masses. 1st International Conference on Smart Energy Carriers. January 21-23, 2019, Naples, Italy.
7. C. Caputo, D. Cirillo, M. Costa, M. La Villetta, R. Tuccillo R., R. Villani. Numerical Analysis of a Combined Heat and Power Generation Technology from Residual Biomasses. Proceedings of the 26th European Biomass Conference and Exhibition. May 14-18, 2018, Copenhagen, Denmark.

8. M. La Villetta, M. Costa, D. Cirillo, N. Massarotti, L. Vanoli. Performance analysis of a small-scale combined heat and power system powered by woodchips. Proceedings of the 11th Conference on Sustainable Development of Energy, Water, and Environment Systems. October 4-8, 2017, Dubrovnik, Croatia.
9. M. La Villetta, C.T. Chang, M. Costa, A. Macaluso, D. Piazzullo, L. Vanoli. Thermodynamic and economic analyses of combined CHP system fuelled with rice husk. Proceedings of Biennial International Workshop Advances in Energy Studies. September 25-28, 2017, Naples, Italy.
10. D. Cirillo, M. Costa, M. La Villetta, D. Piazzullo, M.V. Prati, V. Rocco. Experimental validation of a one-dimensional steady model for downdraft biomass gasifiers. Proceedings of CHT-17 ICHMT International Symposium on Advances in Computational Heat Transfer. May 28-June 1, 2017, Naples, Italy
11. M. Costa, M. La Villetta, N. Massarotti, D. Piazzullo and V. Rocco. A one-dimensional steady model for downdraft biomass gasifiers. Proceedings of Fourth International Conference on Computational Methods for Thermal Problems THERMACOMP2016. July 6-8, 2016, Georgia Tech, Atlanta, USA.
12. M. La Villetta, F. Marias, M. Costa and N. Massarotti. A one-dimensional model for RDF thermo-chemical conversion on a moving grate of a full scale incineration plant. Proceedings of the 28th International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems (ECOS 2015). June 30-July 3, 2015, Pau, France.
13. M. Costa, M. La Villetta, N. Massarotti. Development of a thermochemical equilibrium model for biomass gasifiers with tar and char formation. Proceedings of ASME-ATI-UIT 2015 Conference on Thermal Energy Systems: Production, Storage, Utilization and the Environment. May 17-20, 2015, Naples, Italy.

Patent

Title: An improved reactor for the gasification of wood-cellulose residual materials.

Abstract: The present invention relates to an improved reactor for the gasification of wood-cellulosic residues. The reactor comprises a reaction chamber equipped with a reduction cone and housed within a containment body; a system for feeding the wood-cellulosic material into the reaction chamber; one or more systems for discharging the ash generated during the gasification process; and devices for managing and controlling the aforementioned components. The material-feeding and ash-discharge systems cooperate with the reaction chamber to prevent slagging, bridging, and channelling phenomena, thereby reducing the risk of operational malfunctions or complete reactor shutdown.

Patent record: [https://patents.google.com/patent/WO2021004658A1/en?q=\(la+villetta\)&oq=la+villetta](https://patents.google.com/patent/WO2021004658A1/en?q=(la+villetta)&oq=la+villetta).

Status: active.

Filing date: 9 July 2019.

ATTIVITA' SCIENTIFICHE

Scientific activities

1. Numerical modelling of integrated energy systems.
2. Development of dynamic TRNSYS models for buildings and energy systems.
3. Modelling of reversible heat pumps, renewable energy systems and thermal energy storage.
4. Modelling of district heating and cooling networks.
5. Analysis of building energy flexibility and demand response strategies.
6. Experimental characterization of reversible heat pumps.
7. Development and use of a laboratory-scale heating and cooling distribution network.
8. Reproduction of controlled outdoor thermo-hygrometric conditions through a "virtual outdoor environment".
9. Heat pump performance analysis in terms of heating and cooling capacity, electrical power input, COP and EER.
10. Assessment of heat pump performance under varying outdoor temperature and relative humidity.
11. Analysis of heat pump control variables, including compressor and fan speeds.
12. Assessment of performance degradation caused by coil fouling and suboptimal refrigerant charge

AMBITI DI RICERCA

Research field

The main research lines concern the numerical modelling and experimental characterization of integrated energy systems. They include the development of dynamic models in TRNSYS for buildings, reversible heat pumps, renewable energy systems, thermal energy storage, and district heating and cooling networks, with particular emphasis on building energy flexibility and demand response strategies. Further research activities focus on the experimental characterization of reversible heat pumps within a laboratory-scale heating and cooling distribution network equipped with an air-duct system designed to generate a controlled "virtual outdoor environment". Heat pump performance, assessed in terms of heating and cooling capacity, electrical power input, COP, and EER, is analysed under varying outdoor temperature and relative humidity, control variables such as compressor and fan speeds, and degradation factors commonly encountered in real applications, including coil fouling and suboptimal refrigerant charge.

ALTRE ATTIVITA

Organisation of, or Participation as a Speaker in, Scientific Conferences in Italy or Abroad

ASME-ATI-UIT 2015 Conference on Thermal Energy Systems

Oral presentation at the ASME-ATI-UIT 2015 Conference on Thermal Energy Systems: Production, Storage, Utilization and the Environment, Naples, Italy. Presentation title: "Development of a Thermochemical Equilibrium Model for Biomass Gasifiers with Tar and Char Formation".

Period: 17-20 May 2015.

12th International Conference on Chemical Process Engineering

Oral presentation at the 12th International Conference on Chemical Process Engineering, organised by the Italian Association of Chemical Engineering (AIDIC), Milan, Italy. Presentation title: "Optimal Tuning of a Thermo-Chemical Equilibrium Model for Downdraft Biomass Gasifiers".

Period: 19-22 May 2015.

28th ECOS Conference

Oral presentation at the 28th International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems (ECOS 2015), Pau, France. Presentation title: "Optimal Split Injection for the Combustion Efficiency Improvement in a GDI Engine".

Period: 30 June-3 July 2015.

28th ECOS Conference

Oral presentation at the 28th International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems (ECOS 2015), Pau, France. Presentation title: "A One-Dimensional Model for RDF Thermochemical Conversion on a Moving Grate of a Full-Scale Incineration Plant".

Period: 30 June-3 July 2015.

29th ECOS Conference

Oral presentation at the 29th International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems (ECOS 2016), Portorož, Slovenia. Presentation title: "Numerical Analysis of a Compression-Ignition Engine for CHP Applications Powered in Dual-Fuel Mode with Syngas and Biodiesel". Supporting documentation is attached for verification purposes.

Period: 19-23 June 2016.

IEA Bioenergy Task 33 Workshop on Small-Scale Gasification for CHP

Oral presentation at the IEA Bioenergy Task 33 Workshop on Small-Scale Gasification for CHP, Innsbruck, Austria. Presentation title: "CMD ECO20: A Small-Scale Combined Heat and Power System at an Early Commercialisation Stage Based on Gasification and Syngas Conversion in an Internal Combustion Engine".

Period: 3 May 2017.

19th SDEWES Conference

Oral presentation at the 19th Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES), Rome, Italy. Presentation title: "Development of a Co-Simulation Platform for Dynamic Simulation between Building Thermal Systems and the Electrical Network".

Period: 8-12 September 2024.

Oral presentation at the 19th Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES), Rome, Italy. Presentation title: "Dynamic Simulation of a Heat Pump for Building Applications Oriented to Assess the Potential for Demand Response and Ancillary Services Supply".

Period: 8-12 September 2024.

Scientific Advisory Board – 20th SDEWES Conference

Invited member of the Scientific Advisory Board of the 20th Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES), held in Dubrovnik, Croatia, on 5-10 October 2025. Membership involved the systematic peer review of conference submissions, together with eligibility for preferential registration conditions and availability to serve as a session Chair or Co-Chair.

Period: 10 July 2024-present