

MARCO SIMONETTI

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Personal details

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Profile summary

I'm an assistant professor (tenure track) in thermodynamics and heat transfer at Politecnico di Torino (Italy), with a 15 year's background as a HVAC project engineer and construction supervisor. I'm experienced in heating, cooling, ventilation and sanitary systems for industrial, residential and tertiary buildings, with a strong focus on innovative and sustainable design. I have a special expertise in application of CFD (Computational Fluid Dynamic) to cooling and heating problems.

My multi-faceted professional and academic experience has required the development of operational and soft skills like problem solving attitude and a refined communication ability within international workgroups.

Key competencies

Professional skills

- Building services design: heating, ventilating, air conditioning and hydraulic plants
- Cooling systems design: water and air systems, direct expansion, sorption cycles, very-low temperature, large scale
- Energy audit
- Feasibility studies
- Detailed sizing of equipment
- Selection of components and sub-system
- Design and construction of special test-beds and laboratories
- Project management
- Preparation of tender documentation for public and private international bids
- Construction supervision

Modelling/numerical skills

- Analytical modelling of Heat and mass transfer
- Nodal numerical modeling of thermal systems
- Computational fluid dynamic (CFD) and thermal FEM (Finite Element Method) numerical modeling of heat exchangers, multi-phase flows, heat transfer, indoor and outdoor environment
- Scaled and full size experimental testing of innovative design
- Renewable energy systems dynamic simulation
- Advanced comfort design
- Dynamic simulation of systems
- Financial feasibility analysis

Professional and scientific software used proficiently

- Microsoft Office
- Autodesk Autocad
- Edilclima, MC4 (Italian energy standard and integrated building services CAD)
- Ansys Fluent (Computational Fluid Dynamic and Finite Element Method analysis)
- DesignBuilder/Energy+ (Dynamic nodal simulation of building and HVAC systems)
- Polysun (Transient nodal simulation of Renewable energy systems)
- CoolPack (simulation models for refrigeration systems developed by Technical University of Denmark DTU)
- FlexPDE (Partial Differential Equations solver)

Relevant work experience

- **2017-today.** I serve as **Assistant Professor (Tenure Track)** in Thermodynamics and Heat Transfer at Energy Department of Politecnico di Torino. My research focuses on: development of innovative solar driven adsorption systems, low energy cooling of buildings, application of CFD to HVAC and exergy analysis of human environmental comfort. I'm currently participating in a joint program, funded by EranetMed consortium, with American University of Beirut (AUB), Armines Paris and Université Claude Bernard Lyon 1. The project focuses on innovative low-energy air-conditioning systems. I authored 39 scientific publications in international journals and conferences that I also presented in many international technical conferences and workshops. I am the co-inventor of 3 patents (1 pending).
- **2002-2016.** In my **professional activity** I have been responsible for the design and the construction supervision of HVAC, sanitary and electrical plants up to the size of 3.9 million euros, for large residential housing, offices, hospital and industrial buildings. Among these projects:

Year	Project and services	Installation cost
2014	Final design of energy retrofit for Voghera (Italy) public hospitals.	1.1M€
2008-2014	HVAC and sanitary plants designer and construction supervision for new Leisure and Spa center in Ostana (Italy)	400k€
2007-2012	HVAC and sanitary water system final design and installation supervision for the renovation of the medieval Roddi Castle, near Alba (Italy)	350k€
2006	HVAC final design for tertiary sector building renovation in Milan (Italy)	3.9M€
2003-2006	HVAC and electrical preliminary and final design of 2006 Winter Olympics media village "Villa Claretta" Torino (Italy)	3.8M€
2005	Final design of refrigeration plant for 8,000m ² medical depot for Unifarma company in Alessandria (Italy)	1.2M€
2004	Definitive design for HVAC plant of 12,000m ² aged care residence "Area Mongrando" in Torino (Italy)	1.5M€
2003-2006	HVAC and sanitary plants designer and construction supervisor for new residential and commercial buildings "Borgata Paradiso", in Torino (Italy)	1.1M€
2003-2005	HVAC and sanitary plants designer and construction supervisor of "Social City", offices and laboratories for social company consortium "Gruppo Abele" in Torino	290k€

In several occasions I have been appointed to solve special problems in building design, by using advanced modeling techniques, as Finite Element Method (FEM) and Computational Fluid Dynamics (CFD), dealing with problems ranging from thermal-bridges in complex structure to the simulation of indoor ventilation systems, double-skin façade effectiveness and advanced comfort simulation; a list of the most relevant among my consultancy activities is as follows:

Year	Project
2014-2016	New offices for Reale Mutua Torino. CFD comfort analysis. The CFD analysis compared different systems and supported the selection of the most effective one for construction.
2014	CFD comfort analysis for the new shopping mall Iper in Arese (Milan, Italy). The CFD studied the very large hall and external aerodynamic.
2011-2013	CFD transient optimization of large refrigeration water storages for the European "Fusion for Energy" facility in Padua (Italy).
2011	Conjugated fluid-solid CFD analysis of thermal stress, due to solar irradiation on a carbon fiber structural reinforcement of an ancient dome in L'Aquila (Italy).
2009	CFD analysis of double-skin façade for the new Bracco pharma company offices in Milan.
2007	Thermal bridge analysis of special structural joint of the new EUR building in Rome, designed by arch. Fuksas.

I also have been involved in the design, construction and commissioning of several **one-off design of cooling systems** for non-civil application, ranging from little application to large system, at different operative temperatures; a list of the most significant is as follow.

Year	Project and services	My role	Cooling temp.	Cooling power
2016	Design and construction of a climatic test bench for radiator caps, for Reutter GmbH	Designer	-40 °C	6 kW
2016	Climatic cells for testing cars for FCA	Commissioning	-40 °C	60 kW
2012-2014	Fusion for Energy: Supply of the Cooling Plant for the SPIDER and MITICA Experiments in Padua	CFD (Computational Fluid Dynamic) senior analyst	+20/+55 °C	68,000 kW
2012	Laboratory test facility "Ventisol" for open-cycle solar-DEC at Politecnico di Torino	Tender procedure officer, Designer, Construction Supervisor, Commissioning	+15 °C	2 kW
2010	Solar cooling laboratory HeliosHP at Politecnico di Torino	Tender procedure officer, Designer, Construction Supervisor, Commissioning	+5 °C	2.5 kW
2010-2013	Experimental solar cooling plant in Torino (1 st solar cooling built in Torino)	Monitoring scientist (monitored via SCADA tools and in-field measurements)	+5 °C	9 kW
2005-2006	Refrigeration plant for 8,000m ² medical depot for Unifarma in Alessandria (Italy)	Designer	+16 °C	1,500 kW
2005-2006	Analysis of thermal-induced flutter phenomena in the cooling stage of an air-flotation continuous strip coating machine, for FATA Hunter	Principal Investigator. CFD and FEM analyst	+280/ +70 °C	4,410 kW
2002	Cooling system of an artificial skylight room for military jet testing, for Alenia	Analyst	20°C	350kW

- **2015-2016.** As an **international consultant**, I have been involved in a United Nations Development Program activity in Turkey, named "Provision of services for developing minimum building energy performance standards (MPBEPS) and nearly zero energy buildings (nZEB) approach for Turkey". I am appointed Expert mechanical engineer in the Joint Venture Steget Torino – IRD engineering Roma.
- **2014-2015.** Where I served as a **CTO**, in Euclide engineering in Torino, I coordinated the work of 6 experts, operating feasibility studies and retrofit interventions on large building stocks, owned by private and public bodies, in many regions of northern Italy, in Lazio region, in Sardinia region.
- **2015-2016.** As a **research assistant** I earned a seed-grant from the Siebel Energy Institute (USA) for my work in collaboration with the School of Architecture of Princeton University (USA).
- **2007-2010.** During my **post-doc** at the Energy department of Politecnico di Torino, I have led a team of 19 experienced researchers and designers from 4 different academic institutes in a comprehensive, 3-year study on energy efficiency aimed at hospitals in north-western Italy. The work analyzed 70 health care facilities, and developed detailed technical financial projects for the energy renovation of 3 major hospitals.
- **2007-2016.** As a **contract professor in Environmental Control Techniques, Renewable energy systems and Building Physics**, I have trained more than 700 hundred professional architects and engineers, while deep-rooting my basic knowledge of thermodynamics and fluid dynamics. Since 2013 I taught courses in English only.

Educational background

2007 PhD in Energetics (Thermodynamics and heat transfer) at Politecnico di Torino. Thesis title: "Application of CFD to natural climatization of building system" (original text in Italian).

2001 Master degree in Aerospace Engineering at Politecnico di Torino.

List of publications

Proceedings

1. Simonetti, M., Surra, M., *Integrazione dei sistemi di ventilazione ibrida negli edifici*, atti del convegno AICARR, Bologna 18 Ottobre 2001
2. Masoero, M., Simonetti, M., Surra, M., *Natural and hybrid systems for the ventilation and the air conditioning of a university complex*, atti del 7th Rheva World Congress, Clima 2000, Napoli 2001
3. Masoero, M., Ostorero, C., Simonetti, M.; Surra, M., *L'integrazione edificio-impianto nell'architettura sostenibile*, atti del convegno internazionale AICARR 2002, Milano 7-8 Marzo 2002.
4. Masoero, M., Ostorero, C., Simonetti, M.; Surra, M., *Sustainable design for the Winter Olympic Game 2006*, atti del convegno internazionale AICARR 2004, Milano 3-4 Marzo 2002
5. Masoero, M., Ostorero, C., Simonetti, M.; *Complessità e contraddizione del costruire e dell'abitare eco-sostenibile*, atti del convegno AICARR, Bologna 2005
6. Fracastoro, G.V., Degiorgis, L., Serraino, M., Simonetti, M., *Interventi sostenibili di riqualificazione energetica degli edifici*, atti del convegno AICARR Bologna 2005
7. Filippi, M., Simonetti, M., *Ice Stadium Cooling and air conditioning system*, atti del convegno International Forum «The Sports Facility», CIO-Agenzia Torino 2006, Torino 2006
8. Simonetti, M., Fracastoro, G.V., Perino, M., *CFD transient analysis of night cooling strategy applied to school building*, proceedings of IAQVEC 2007, Sendai (Japan) 2007
9. Simonetti, M., Fracastoro, G.V., Perino, M., *Comparison of virtual sphere and CFD transient modelling of night cooling of buildings with natural ventilation* proceedings of Roomvent 2011, Trondheim (Norway) 2011 ISBN: 978-82-519-2812-0
10. Fracastoro, G.V., Yang, Y., Coppa, G., Simonetti, M. *Atmospheric turbidity measurement in Torino: a comparison between 1975 and 2010* proceedings of ISES World Congress 2011, Kassel (germany)
11. Pellegrino, M., Simonetti, M., Fournier, L., *A field survey in Calcutta. Architectural issues, thermal comfort and adaptive mechanisms in hot humid climates*. Proceedings of 7th Windsor Conference: The changing context of comfort in an unpredictable world Cumberland Lodge, Windsor, UK, 12-15 April 2012. London: Network for Comfort and Energy Use in Buildings, <http://nceub.org.uk>
12. Moradi, A., Sani, E., Simonetti, M., Francini, F., Chiavazzo, E., Asinari, P., *CFD modeling of solar collector with nano-fluid direct absorption for civil application* Microgen 3, International Conference on Microgeneration and Related Technologies, Napoli 15-17 Aprile 2013
13. Badami, M., Portoraro, A., Simonetti, M., Tebaldi, P., *Thermodynamic modelling of an adsorption chiller based on a zeolite* Proceedings 2015 ASME International Mechanical Engineering Congress & Exposition IMECE, November 13-19, 2015, Houston, Texas
14. Pellegrino, M., Simonetti, M., Chiesa, G., *Occupants' behaviour and energy consumption: from model to reality*, 1st International Conference on Energy Research and Social Science, 2-5 April 2017, Sitges, Spain
15. Gentile, V., Simonetti, M., *Water production from atmosphere in arid climate*, ISES Solar World Congress, 29 October-02 November 2017, Abu Dhabi, UAE

Journals

16. Simonetti, M., Fracastoro, G.V., *Prestazioni energetiche e comfort ambientale: studio numerico di sistemi di ventilazione naturale*., CDA Condizionamento dell'Aria, n°4 Aprile 2006, pagg.-48-54
17. Filippi, M., Simonetti, M., *Tecnologie per il trattamento dell'aria*, Spazio Sport, trimestrale di architettura per lo sport, anno 1 n°1, p. 143
18. Simonetti, M., Fracastoro, G.V. *A numerical and experimental study of an airing device for controlled natural ventilation of a building*, International Journal of Ventilation, Vol. 7 n. 3 December 2008
19. Maahsen-Milan, A., Simonetti, M. Auditoria and public halls. *The preserved architectonic heritage, in the perspective of sustainability* Procedia Engineering, Volume 21, 2011, Pages 711–720
20. Pellegrino, M., Thakurb B., Guhac, H., Simonetti, M. *Energy efficient choice of brick façade in Kolkata, India* Procedia Engineering, Volume 21, 2011, Pages 737–744
21. Pellegrino, M., Simonetti, M. and Fournier L. *A field survey in Calcutta. Architectural issues, thermal comfort and adaptive mechanisms in hot humid climates* Procedia Engineering, Volume 21, 2011
22. Simonetti M., Degiorgis L., Fracastoro G. V., Ghafoor A., Arboit M. E., *In-field monitoring and numerical parametric analysis of a small size adsorption solar cooling plant in Italy*, Renewable energy and power quality journal, pp. 5, 2012, Vol. 10, ISSN: 2172-038X

23. Montrucchio, V., Simonetti, M., *The Systemic Design Approach Applied to the Analysis of Buildings* The International Journal of Design Management and Professional Practice, Volume 6, Issue 2, Pages 97-113
24. Chiesa, G., Simonetti, M., Grosso, M., *A 3-field earth-heat-exchange system for a school building in Imola, Italy: Monitoring results* Renewable Energy Volume 62, February 2013, Pages 563–570
25. Maahsen-Milan, A., Pellegrino, M., Oliva, L., Simonetti, M., *Urban Architecture as Connective-Collective Intelligence. Which Spaces of Interaction?* Sustainability 2013, 5, 2928-2943; doi:10.3390/su5072928
26. Moradi, A., Sani, E., Simonetti, M., Francini, F., Chiavazzo, E., Asinari, P., *Carbon-nanohorn based nanofluids for a direct absorption solar collector for civil application* Journal of Nanoscience and Nanotechnology 15 (5), 3488-3495
27. Pellegrino, M., Simonetti, M., Chiesa, G., *Reducing thermal discomfort and energy consumption of Indian residential buildings: Model validation by in-field measurements and simulation of low-cost interventions* Energy and Buildings Volume 113, 1 February 2016, Pages 145-158 DOI: 10.1016/j.enbuild.2015.12.015
28. Grosso, M., Fracastoro, G.V., Simonetti, M., Chiesa, G., *A Hybrid Passive Cooling Wall System: Concept and Laboratory Testing Results* Energy Procedia 78:79-84 November 2015 DOI: 10.1016/j.egypro.2015.11.118
29. Simonetti, M., Gentile, V., Fracastoro, G.V., Freni, A., Calabrese, L., Chiesa, G., *Experimental testing of the buoyant functioning of a coil coated with SAPO34 zeolite, designed for solar DEC (Desiccant Evaporative Cooling) systems of buildings with natural ventilation* Applied Thermal Engineering, 2016, DOI: 10.1016/j.applthermaleng.2016.02.072
30. Simonetti, M., Fracastoro, G.V., Chiesa, G., Sola, S., *Numerical optimization and experimental testing of a new low-pressure heat exchanger (LoPHEX) for passive ventilation of buildings*, Applied Thermal Engineering 2016, DOI: 10.1016/j.applthermaleng.2016.04.143
31. Simonetti, M., *Conscious Use of the Virtual Sphere Modeling in the Simulation of Passive Night Cooling of Buildings*, Open Journal of Energy Efficiency 5 (02), 59, 2016
32. Simonetti, M., Chiesa, G., Grosso, M., Fracastoro, G.V., *NAC wall: an open cycle solar-DEC with naturally driven ventilation* Energy and Buildings, 2016, DOI: 10.1016/j.enbuild.2016.07.065
33. Lucia, U., Simonetti, M., Chiesa, G., Grisolia, G., *Ground-source pump system for heating and cooling: Review and thermodynamic approach* Renewable and Sustainable Energy Reviews - Volume 70, April 2017, Pages 867-874
34. Chiesa, G., Simonetti, M., Ballada, G., *Potential of attached sunspaces in winter season comparing different technological choices in Central and Southern Europe* Energy and Buildings Volume 138, 1 March 2017, Pages 377–395, <http://dx.doi.org/10.1016/j.enbuild.2016.12.067>
35. Simonetti, M., Gentile, V., Fracastoro, G.V., Belmonte, R., *Optimized low pressure solar DEC with zeolite based adsorption* Energy Procedia 122, 1033-1038
36. Jarre, M., Noussan, M., Simonetti, M., Poggio, A., *Opportunities for heat pumps adoption in existing buildings: real-data analysis and numerical simulation*, Energy Procedia 134, 499-507
37. Simonetti, M., Gentile, V., Chiesa, G., Nigra, M., *Preliminary study of the hybrid solar DEC “NAC wall” system integration in buildings facades in urban context* Energy Procedia 134, 588-597
38. Simonetti, M., Gentile, V., Liggieri, L., Gallo Carrabba, M., Fracastoro, G.V., *Experimental analysis of “NAC-wall” for hybrid ventilation mode*, Energy and Buildings 152, 399-408, <https://doi.org/10.1016/j.enbuild.2017.07.047>
39. Hout, M., Ghaddar, N., Ghali, K., Ismail, N., Simonetti, M., Fracastoro, G. V., Virgone, J., Zoughaib, A., *Displacement ventilation with cooled liquid desiccant dehumidification membrane at ceiling; modeling and design charts*, Energy 139, 15 november 2017, 1003-1015, <https://doi.org/10.1016/j.energy.2017.08.046>

Book chapter

40. Simonetti, M. *Analisi fluidodinamica (Fluid Dynamic analysis)*, in Grosso M. *Il raffrescamento passivo degli edifici (Passive cooling of buildings)*, original text in italian, pp. 555-572 II edizione Maggioli 2008

Patents

41. - It TO2015U000038 “Sistema integrato per il trasferimento di energia da fonti rinnovabili ad un’utenza” (Integrated multi-sources energy system) National file date 11 Marzo 2015
42. - PCT/IB2016/055195 “Module of ventilation and biological purification of internal and external air to an environment, and relevant method” National file date 12 September 2015, international file date 31 August 2016.
43. – IT 102017000120788, pending “Metodo per la produzione di acqua dall’aria basato su calore a bassa temperatura, macchina e sistema corrispondente” (Method for the production of water from air driven by low temperature heat, system and device). Italian and PCT priority file data 24/10/2017.