Stefano Mazzoni, PhD

Date of Birth: October 4th, 1985
Nationality: Italian

Location: Singapore since 2016

Work experience

Energy Smart Solutions Pte Ltd Singapore January 2019 - Current

Co-Founder, Partner and CTO

Company providing solutions and consulting for Net-Zero Decarbonised project, with up to 50% C_{APEX}, 40% O_{PEX} and 100% CO_2 savings. Company received **500,000 $** Proof of Value (POV) grant from ESG, I am the Principal Investigator of the Project.

- **Patent: Inventor of IP Technology Disclosure 2019-038**
- Completed consulting Projects with *Worley-Parson; Jurong Port; Jurong Town Corporation* up to 50M$ savings and 25% CO2 emission avoided
- Master planning and design of greenfield projects - highly integrated energy-mix and different end-user demands
- Optimal Dispatch and Unit commitment problem solving for optimal operations:
  - *Integrating and retrofitting renewable energy, cogeneration solutions, energy storage systems;*
  - *Performance and condition monitoring for optimal maintenance and operations, by the integration of Artificial Intelligence.*

Nanyang Technological University (NTU) Singapore

Senior Research Fellow July 2020 – Current

Energy Conversion Systems, Smart Multi Energy System (SMES)

- Working on optimization of multi-energy system and smart-district for clean energy environment by the ©E-OPT software platform development.
- Responsible for the design of the 8M$ cogeneration power plant at Jurong Port, Singapore. The adoption of the ©E-OPT software platform developed by my team allowed up to **1M$ CAPEX saving** during design of power plant and energy systems. **15% Primary Energy Savings** and up to **20% CO2 Emission Reduction** have been also proven.
- Validating Punggol Digital District (District Cooling) Design by ©E-OPT software platform utilization.

Research Fellow July 2016 – June 2020

Energy Conversion Systems, Smart Multi Energy System (SMES)

- Leading and Coordination of the Work Package "Polygeneration" (SMES Project)
  - *Coordination of the team: Research Associates, PhD Candidates and MD students*
  - *Actively involved in the Steering Committee of the whole SMES project*
  - *Meeting and discussion with national agency (i.e. NEA, EMA) and partner companies (i.e. Shell, JTC)*
- Developed of the Optimal Planning simulation Tool (OPT)
  - *Modelling of SMES components (Engines, Chillers, Heat Exchangers, Building, Grid, Thermal Energy Storage, others); District Cooling Systems and Cooling Phase Change Material for Cooling Application.*
  - *Multi-Objective function approach for accounting techno-economic optimization*
  - *Advanced mathematics: Hybrid Evolutionary and Simultaneous Algorithms coupled with Artificial Intelligence*

Shell Singapore November 2018 – June 2019

Consultant

Energy and CO_2 Footprint Reduction Study for Shell Jurong Island Petrochemicals Complex

- Pinch Point Analysis technique and energy optimization by integrating and retrofitting the actual plant configuration.
- Definition of a roadmap for allowing up to 95% CO_2 reduction within 2035

Sustainable Development of Energy, Water and Environment Systems (SDEWES) August 2018 - Current

Scientific Advisory Board Member

- Evaluations of scientific journal paper, organization of conference and presentation.

Scientific Reviewer Singapore January 2015 - Current

- Energy Conversion and Management, Applied Energy Paper Reviewer, Energy, Renewable Energy & Journal of Environmental Management, Applied Thermal Engineering (**ELSEVIER**), **Energies** MDPI, American Society of Mechanical Engineers (**ASME**) Turbo Expo. Appointed recently as **Review Editor** at **Frontiers Journal**.

Singapore, August 2022
Dr. Stefano Mazzoni

University of Roma Tre Rome, Italy

Research Fellow June 2014 - June 2016

Energy Conversion Systems – Concentrated Solar Power Plants

- Developed component models for CSP power plants (OMSoP European Project)
- Technical / economic analysis and optimization for CSP power plants (OMSoP European Project)
- Laboratory Leader for Solar and Turbomachinery Test (OMSoP European Project)

Contract Professor June 2014 - June 2016

- Steering PhD candidates and MD students
- Thermodynamics and Fluid Dynamics Applied on Machines
- Machines and Energy Conversion Systems
- Member of the Examination Board for Turbomachinery, Fluid Machine and Thermodynamics and Fluid-Dynamics Applied on Machines

Cooperation Contract September 2010 – May 2014

- Developed component models for IGCC power plants (H2-IGCC European Project)
  - *Gasification Isle Simulator (Matching of elementary component models – Transfer Functions)*
  - *Power Isle Simulator (Matching of elementary component models, Turbomachineries and Heat Transfer Devices)*

Italian Ministry for University and Research Rome, Italy March 2016

***Project Evaluator**:* MIUR-DAAD Joint Mobility Program

Co.Se.A Bologna, Italy November 2014 - February 2016

Consultant: Internal Combustion Engine Failure Analysis & Litigation on the Green Certificate for Power Generation

Education

University of Roma Tre Rome, Italy January 2011 – June 2014

PhD at Doctoral School of Industrial and Mechanical Engineering

- Thesis Title: IGCC Power Plant Simulator: Gas Turbine and Steam Cycle

Master degree of Industrial and Mechanical Engineering (110 out of 110 points cum Laude) Oct. 2007 – May 2010

- Thesis Title: Steam Cycle Simulator for Combined Power Plants

Bachelor of Industrial and Mechanical Engineering (107 out of 110 points) Oct. 2004 - December 2007

- Thesis Title: Emulsions in reciprocating engines

Association of Engineering Rome, Italy June 2010 – October 2010

Certification as Industrial Engineer

Skills

Technical Skills

- Energy Conversion Systems, Development / Modelling of power plant component models, Fluid Machines and Turbomachinery, Internal Combustion Engine, Steam Cycles, Solar Power Plants, Heat Transfer Devices, Gas Turbine Cooling, Optimization Techniques, Neural Network, Unit Commitment & Master planning

Computer Skills

- Programming Fortran 77, Matlab, Python, Neuro Dimension, Aspen Suite, ANSYS, AutoCAD, Microsoft Office Suite, Web Browser, Photoshop Suite, Windows and Mac OS

Personal Skills

- Team Work, Leading PhD candidates, Master Degree students and technicians, Speaking at conferences
- Awarded as Outstanding Reviewer for Applied Energy International Journal, ELSEVIER.
- Awarded as Distinguished Scientist by Sustainable Development of Energy, Water and Environment Systems

Languages

- Native speaker: **Italian**
- Professional (spoken/written): **English**
- School Level (spoken/written): **German**

Interest

- Photography (Professional Level), Travelling, Chess Playing (semi-Pro Level) , Sport (Cycling, Soccer, Horse Riding, Swimming, Diving), Cinema, Music and Art

Singapore, August 2022
Dr. Stefano Mazzoni

Publications

1. Nastasi, B., **Mazzoni, S**., Groppi, D., Romagnoli, A., Astiaso Garcia, D.: '*Comparing optimal Hydrogen solutions in Renewable Energy Community in Islands'*, SDEWES 2020

2. **Mazzoni S**., Ooi S., Desideri U., Nastasi B., Comodi G., Romagnoli A.: '*The Adoption of a Planning Tool Software Platform for Optimized Polygeneration Design and Operation - a District Cooling Application in South-East Asia'*, Applied Thermal Engineering, 199, art. no. 117532, 2021

3. Bartolini, A., **Mazzoni, S**., Comodi, G., Romagnoli, A. '*Distributed energy systems to lower carbon emissions in future industrial districts*, Applied Energy, 2021, 301, art. no. 117324.

4. Nastasi, B., **Mazzoni, S.,** Groppi, D., Romagnoli, A., Astiaso Garcia, D.: '*Optimized integration of Hydrogen technologies in Island energy systems*, (2021) Renewable Energy, 174, 850-864, 2021

5. **Mazzoni, S.,** Sze, J.Y., Nastasi, B., Ooi, S., Desideri, U., Romagnoli, A.: '*A techno-economic assessment on the adoption of latent heat thermal energy storage systems for district cooling optimal dispatch & operations'* (2021) Applied Energy, 289, art. no. 116646.

6. Nastasi, B., **Mazzoni,** S., Groppi, D., Romagnoli, A., Astiaso Garcia, D.: '*Solar power-to-gas application to an island energy system*', (2021) Renewable Energy', 164, pp. 1005-1016.

7. Rigo-Mariani, R., Chea Wae, S.O., **Mazzoni, S.:** '*Impact of the Economic Environment Modelling for the Optimal Design of a Multi-Energy Microgrid'*, (2020) IECON Proceedings (Industrial Electronics Conference), 2020-October, art. no. 9254730, pp. 1837-1842.

8. Baldasso E, Mondejar ME, **Mazzoni S**, Romagnoli A, Haglind F.: '*Potential of liquefied natural gas cold energy recovery on board ships*' J Clean Prod 2020;271:122519. doi:10.1016/j.jclepro.2020.122519.

9. Benedetto Nastasi , **Stefano Mazzoni** , Daniele Groppi, Davide Astiaso Garcia, Alessandro Romagnoli: '*Optimized integration of Hydrogen technologies in Island energy systems*', SDEWES 2020.

10. Rigo-Mariani R., Ooi S., **Mazzoni S**., Romagnoli A.: '*Comparison of Optimization Frameworks for the Design of a Multi-Energy Microgrid',* Applied Energy, Volume 257, 2020, ISSN 0306-2619, Elsevier

11. **Mazzoni S**., Ooi S., Nastasi B., Romagnoli, A.: '*Energy Storage Technologies as techno-economic parameters for Master-planning and Optimal Dispatch in Smart Multi Energy Systems',* Applied Energy, Volume 254, 2019, ISSN 0306-2619, Elsevier

12. **Mazzoni S**., Ooi S., Desideri U., Comodi G., Romagnoli A.: '*The Role of Multi-Energy Polygeneration Plants in the Optimization Process of District Cooling & Heating Design and Operation*', 14th Conference on Sustainable Development of Energy, Water and Environment System (SDEWES), 01-05 October 2019, Dubrovnik, Croatia.

13. Li Z., Xu Y., Fang S., **Mazzoni, S**.: '*Optimal Placement of Heterogeneous Distributed Generators in a Multi-Energy Microgrid under Uncertainties'*, IET Renewable Power Generation, August 2019.

14. **Mazzoni S.,** Ooi S., Romagnoli A.: '*Cogeneration Power Plants for Smart-District Optimal Operations: CO2 and Primary Energy Savings in a real industrial application'*, AIP Volume 2123, July 2019, Article 020099.

15. Bartolini A., Romagnoli A., **Mazzoni S.,** Comodi G.: '*Influence of users type on costs and primary energy savings potential for decentralized energy systems'*, International Conference on Efficiency, Cost, Optimization, Simulation and Environmental impact of Energy System, ECOS, Wroclaw, June 2019.

16. **Mazzoni S**., Ooi S., Romagnoli A.: '*Cogeneration Power Plants for Smart-District Optimal Operations: CO2 and Primary Energy Savings in a real industrial application'*, Conference: Technologies and Materials for Renewable Energy, Environment and Sustainability (TMREES), 10-12 April 2019, Beirut, Lebanon

17. Ji D., Rajoo S., **Mazzoni S**., Romagnoli, A.: '*Geometry Optimization of Thermoelectric Module: Simulation and Experimental Study'*, Energy Conversion and Management, Volume 195, 2019, Pages 236-243,ISSN 0196-8904

18. **Mazzoni S.**, S Ooi, A. Tafone, E. Borri, G. Comodi, A. Romagnoli: '*Liquid Air Energy Storage as a polygeneration system to solve the unit commitment and economic dispatch problems in micro-grids applications'*, Energy Procedia, Volume 158, 2019, Pages 5026-5033

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19. Ooi, S., **Mazzoni, S**., Romagnoli, A.: '*Microgrid Application of Polygeneration System Fed by Natural Gas: Effect of Fuel Price on Investment Outlook'*, (2019) 2018 Asian Conference on Energy, Power and Transportation Electrification, ACEPT 2018, art. no. 8610772

20. **Mazzoni, S**., Rajoo, S., Romagnoli, A.: '*A boil-off gas utilization for improved performance of heavy duty gas turbines in combined cycle'*, (2019) Proceedings of the Institution of Mechanical Engineers, Part A: Journal of Power and Energy, 233 (1), pp. 96-110.

21. **Mazzoni S.,** Cerri G., Chennaoui L.: '*A Simulation Tool for Concentrated Solar Power based on Micro Gas Turbine Engine'*, Energy Conversion and Management 174 (2018) 844-854, Elsevier.

22. Ji, D., Wei, Z., **Mazzoni, S**., Mengarelli, M., Rajoo, S., Zhao, J., Pou, J., Romagnoli, A.: '*Thermoelectric generation for waste heat recovery: Application of a system level design optimization approach via Taguchi method'*, (2018) Energy Conversion and Management, 172, pp. 507-516.

23. **Mazzoni S**., Ooi S., Romagnoli, A.: '*Application of Electrochemical Energy Storage Technologies as key Parameters for Optimal Dispatch in Microgrid'*, 13th Conference on Sustainable Development of Energy, Water and Environment System (SDEWES), 01-04 October 2018, Palermo, Italy.

24. Ji D., Rajoo S., **Mazzoni S.,** Romagnoli, A.: '*Simulation and experimental study on geometry optimization of thermoelectric modules'*, 13th Conference on Sustainable Development of Energy, Water and Environment System (SDEWES), 01-04 October 2018, Palermo, Italy.

25. **Mazzoni S.,** Ooi S., Tafone A., Borri E, Comodi G, Romagnoli, A.: '*Liquid Air Energy Storage as a polygeneration system to solve the unit commitment and economic dispatch problems in micro-grids applications'*, 10th International Conference on Applied Energy (ICAE2018), 22-25 August 2018, Hong Kong, China.

26. **Mazzoni S.,** Arreola M. J, Romagnoli A.: '*Innovative Organic Rankine arrangements for Water Savings in Waste Heat Recovery Applications*, Energy Procedia, 143 (2017) 361–366, Elsevier.

27. **Mazzoni S.,** Cerri G., Chennaoui L, Romagnoli A.:' *A Simulation Tool for Concentrated Solar Power to Power applications based on Micro Gas Turbine engines'*, 12th Conference on Sustainable Development of Energy, Water and Environment System (SDEWES), 04-08 October 2017, Dubrovnik, Croatia.

28. **Mazzoni S.,** Arreola M. J, Romagnoli A.: '*Innovative Organic Rankine arrangements for Water Savings in Waste Heat Recovery Applications*, World Engineers Summit – Applied Energy Symposium & Forum: Low Carbon Cities & Urban Energy Joint Conference, WES-CUE 2017, 19–21 July 2017, Singapore

29. Cerri G., Chennaoui L., Giovannelli A., **Mazzoni S**.: '*Turbomachinery based Engine: Concurrent Production of Power and Cool used for Sea Water Desalination*, ETN 8th International Gas Turbine Conference: The Future of Gas Turbine Technology 2016, Brussel, Belgium

30. Cerri.G, Chennaoui L., **Mazzoni S**., Pustina L.: '*Power, Cool and Pure Water by an Integrated Turbomachinery Based Innovative GICE Engine with CryoDesalination-a Novel Seawater Desalination Process'*, Energy and Water in the Gulf Cooperation Council Countries EWGCC 2016, 12-14 April 2016, Ras Al Khaimah, UAE - (Poster Session)

31. Alavi B., Cerri.G, Chennaoui L., **Mazzoni S**.: *'Energy Saving by Refrigeration Vapour Compression Plant Power Regeneration'*, Energy and Water in the Gulf Cooperation Council Countries EWGCC 2016, 12-14 April 2016, Ras Al Khaimah, UAE – (Poster Session)

32. Cerri G., Chennaoui L., Giovannelli A., **Mazzoni S**.: '*Model of a Generic 300 MW F Gas Turbine for IGCC*', International Gas Turbine Congress 2015 Tokyo, Japan

33. Alavi B., Cerri G., Chennaoui L., Giovannelli A., **Mazzoni S**.: '*Optimum Turbomachine Selection for Power Regeneration in Vapor Compression Cool Production Plants*, I World Academy of Science, Engineering and Technology International Journal of Mechanical, Aerospace, Industrial and Mechatronics Engineering Vol:9, No:4, 2015

34. Alavi B., Cerri G., Chennaoui L., **Mazzoni S**.: SASEC 2015, '*Power, Cool and Water Production by Innovative Cycles Fed by Solar Energy'*, Third Southern African Solar Energy Conference SASEC, South Africa May,11-13, 2015 (**Awarded as the best paper of the conference)**

35. Alavi B., Cerri G., Chennaoui L., Giovannelli A., **Mazzoni S**.: SEEP 2014, *'MGT Cycles for Solar Dish Applications*', Proceedings of SEEP 2014, 23-25 November 2014, Dubai

36. Cerri G., Chennaoui l., Giovannelli A., **Mazzoni S**: '*Expander Models for a Generic 300 MW F Class Gas Turbine for IGCC*', ASME TurboExpo 2014, Dusseldorf, DE June 16-20 , 2014

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37. Cerri G., **Mazzoni S.**, Salvini C.: Asme 2013 '*Steam Cycle Simulator for CHP Plants*', ASME TurboExpo 2013, San Antonio Convention Center,, San Antonio, Texas, Usa,June 3-7, 2013

38. Mansouri Majoumerd M., Brehaus P., Smrekar J., Assadi M., Basilicata C., **Mazzoni S**., Chennaoui L., Cerri G.,"*Impact of fuel flexibility needs on a selected GT performance in IGCC application*", ASME TurboExpo 2012, Copenhagen, Denmark, June 11–15, 2012.

Technical Reports for the EUROPEAN UNION

1. Cerri G, **Mazzoni S**., '*MS16 – Dish-MGT Plant Simulator developed'*, OMSoP Milestone MS16, Roma Tre University, Department of engineering, 2016

2. Cerri G, **Mazzoni S.,** '*MS15 - Selected Plant Techno-Economic Plant Arrangements'*, OMSoP Milestone MS15, Roma Tre University, Department of engineering, 2015

3. Cerri G., **Mazzoni S** et Al., '*Report on Short Term Storage Testing and Evaluation'*, OMSoP Deliverable 1.2, Roma Tre University, Department of engineering, 2015

4. Cerri G., **Mazzoni S** et Al., '*Optimum Plant Operating Maps and Control Policies'*, H2-IGCC Deliverable 4.2.4, Roma Tre University, Department of engineering, 2014

5. Cerri G., **Mazzoni S** et Al.., '*Preliminary Turbine Cooling Requirements'*, H2-IGCC Deliverable 3.3.4, Roma Tre University, Department of engineering, 2013

6. Cerri G., **Mazzoni S** et Al., '*Selection of the best IGCC Cycle(s) finished: Options Analysis*, H2-IGCC Milestone 4.1 (2), Roma Tre University, Department of engineering, 2013

7. Cerri G., **Mazzoni S** et Al.., '*Selected Thermodynamic Optimized IGCC Cycles*', H2-IGCC Milestone 5.8, Roma Tre University, Department of engineering, 2013

8. Cerri G., **Mazzoni S** et Al.., '*Investigation on the Data Assumed for the Development of the RO3 H2-IGCC 300MW F Class GT Simulator*', H2-IGCC Report 03008/04002 , Roma Tre University, Department of engineering, 2013

9. Cerri G., **Mazzoni S** et Al.., '*Description of the Models adapted or developed ad hoc for the IGCC&CCS plants'*, H2-IGCC Deliverable 4.2.2, Roma Tre University, Department of engineering, 2012

10. Cerri G., **Mazzoni S** at Al., '*Selection of the best IGCC Cycle(s) finished: Cycle Options Analysis*, H2-IGCC Milestone 4.1 (1), Roma Tre University, Department of engineering, 2011

Intellectual Property

- Energy Dispatch and Energy Planner – 1st Inventor
    - TD2019-038

Singapore, August 2022
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ANNEX

Projects

SMES (2016 - On-going)

The proposed Smart Multi-Energy Systems (SMES) project hence aims to develop and demonstrate an intelligent multi-energy management & information system at a commercial industrial site through seamless integration of energy generation, storage and demand management facilities across the electric, thermal, and gas networks. This system will also have an enhanced information and communication technology (ICT) platform for supply/demand management and real-time energy market interactions.

Formulation of this project resulted from two sets of data-points: 1) Theoretical studies and simulations on multi-energy systems have shown the potential of greater than 30% cost reduction1. 2) JTC's effort in addressing integrated estate management at Biopolis and Fusionopolis resulted in 15-18% cost savings. This effort at One-North did not extend beyond building automation and air-conditioning systems. Thus a full systems-integration and optimization approach that includes a montage of energy sources, load management, and market interaction clearly holds the potential to exceed both the One-North effort and the theoretical predictions of at least 30% cost reduction.

OMSoP (2014-2016)

The OMSoP project, co-funded by the European Union's 7th Framework Programme for Research and Development aims to provide and demonstrate technical solutions for the use of state-of-the-art concentrated solar power system (CSP) coupled to micro-gas turbines (MGT) to produce electricity. The intended system will be modular and capable of producing electricity in the range of 3-10 kW. In February 2013, the OMSoP project kicked off with 8 partners from 5 countries with a total budget of 5,8 million euro. Successful dissemination and implementation of the project results should result in the demonstration of the stand-alone-system, addressing the key innovation bottlenecks: the high temperature solar receiver, the stand-alone solar dish concentrator and the more reliable micro-gas turbine. During the 4-year project, the City University London will provide coordination and management service assisted by the European Turbine Network (ETN) who is also responsible for the dissemination activities.

https://omsop.serverdata.net/Pages/Home.aspx

H2-IGCC (2010-2014)

The overall objective of the H2-IGCC project is to provide and demonstrate technical solutions which will allow the use of state-of-the-art highly efficient, reliable gas turbines (GTs) in the next generation of Integrated Gasification Combined Cycle (IGCC) plants. The goal is to enable combustion of undiluted hydrogen-rich syngas with low NOx emissions and also allowing for high fuel flexibility. The challenge is to operate a stable and controllable GT on hydrogen-rich syngas with emissions and processes similar to current state-of-the-art natural GT engines. The H2-IGCC project aims to tackle this challenge as well as fuel flexibility, by enabling the burning of back-up fuels, such as natural gas, without adversely affecting the reliability and availability http://www.h2-igcc.eu/default.aspx

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