Luca Mazzotta

Curriculum Vitae

CONTACTS

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PERSONAL INFORMATION

Language proficiency: Italian (native), English (C1)

1. EDUCATION

Туре	Year	Institution	Grade
Doctorate of Philosophy in Energy and Environment	Ongoing:	Sapienza University of	-
	Third	Rome / Baker Hughes	
	year		
Master's degree in Mechanical Engineering	2021	Sapienza University of	110/110
		Rome	
Bachelor's degree in Mechanical Engineering	2019	Sapienza University of	96/110
		Rome	

2. VISITING RESEARCH PERIOD

Start	End	Duration	Institution	Position
August 2023	December 2023	6 months	Cardiff University	PhD Visiting student

3. WORK EXPIERENCE

Start	End	Duration	Company	Position
January 2022	Ongoing	3 years	Baker Hughes (Florence)	Aerothermal
				Combustion Engineer

4. RESEARCH ACTIVITIES

4.1 Relevant research skills

- Advanced knowledge of commercial software for modelling of fluid dynamics and combustion: ANSYS OpenFOAM
- CFD analysis
- Advanced knowledge of gas turbine systems
- Expert programmer of Python
- Expert in combustion chemistry and NOx emissions
- Advanced knowledge of combustion instabilities (thermoacoustics, flashback, blowoff)
- Advanced knowledge of combustion phenomena of high hydrogen content mixture (hydrogen, ammonia and blends)
- Advanced knowledge of experimental diagnostics tools (Chemiluminescence, PIV, Thermoacoustic measurements, thermocouples measurements...)

The following lists refer to the most recent relevant academic and industrial research activities, grouped by topic.

4.2 Academic research activities

Year (s)	Keywords	Brief description
2024	NOx emissions, Cracked ammonia, Thermoacoustic instabilities, CRN	The work is based on the study of combustion of high-hydrogen mixtures (mixtures with ammonia and methane) in industrial burners. The analyses were carried out experimentally and numerically using LES in Ansys Fluent, first validating the numerical model and then investigating various parameters to understand the suitable mixture to achieve the least amount of emissions. Combustion of mixtures derived from ammonia cracking was also investigated. The analysis was concluded with the development of low-order models based on CRN (Chemical Reactor Network) again for emission estimation.
2023	Combustion Chemistry, NOx emissions, CFD, LES	The activity deals with the development of numerical model able to reproduce correctly the NOx emissions downstream of the combustion process. Kinetic scheme comparison through 1D simulation and RANS and LES simulations carried out in Ansys Fluent.
2022	Flex&Confu European Project	Numerical investigation on hydrogen / ammonia / methane blends combustion: emissions, dynamics and flame stabilization in collaboration with Baker Hughes and Cardiff University. Numerical model validated through experimental data.

5. INDUSTRIAL ACTIVITIES

5.1 Relevant hard skills

- Reactive CFD analysis of industrial burners.
- Feasibility study of hydrogen-ammonia mixtures combustion in industrial gas turbines.
- Impact of hydrogen-ammonia flames on NOx emissions.
- Combustion Dynamics.

5.2 Job activities

The following lists refer to the relevant activities, during my work experience as combustion during my PhD in collaboration with Baker Hughes company.

Year (s)	Keywords	Brief description
2022-2024	Gas Turbine burner Combustion NOx emissions Flame stabilization Hydrogen/Ammonia	Investigation of flame characteristics and dynamics of hydrogen and ammonia flames in a full scale gas turbine burner of Baker Hughes company both numerically and experimentally. The main goal is the development of numerical models to investigate and predict NOx emissions in order to reduce pollutant downstream of combustion processes for decarbonization purpose.

6. ADVANCED COURSES

Year	Name
2022	Advanced Research in Turbomachinery (ART) – Florence (IT)

7. TEACHING EXPERIENCE

7.1 Regular Academic Appointments

The following list refers to lectures for Bachelor and Master of Science course in Mechanical and Energy Engineering of Sapienza University of Rome.

year	Institution	Course Name	CFU
2022/2023/2024	Sapienza	Fluid Machinery	6
2022/2023/2024	Sapienza	Computational Thermo Fluid Analysis in Fluid Machinery	6
2022/2023/2024	Sapienza	Tecnologie dell'Idrogeno e dello	6
		Storage Elettrochimico	

Legend

C=Session chair O=Track organizer P=Presenter A= Attendee

Year	Role	Conference/Workshop	Location
2024	A/P	40 th Symposium of the Combustion Institute	Milan (IT)
2024	A/P/O/C	ASME Turbo Expo 2024	London (UK)
2024	A/P	46 th Meeting of the Italian Section of the Combustion Institute	Bari (IT)
2023	A	2 nd Symposium on Ammonia Energy	Orleans (FR)
2023	A/P	ASME Turbo Expo 2023	Boston, MA, USA
2023	A/P	45 th Meeting of the Italian Section of the Combustion Institute	Florence (IT)
2022	A	1 st Symposium on Ammonia Energy	Cardiff (UK)
2022	А	Advanced Research in Turbomachinery (ART)	Florence (IT)
2022	A/P	ASME Turbo Expo 2022	Rotterdam (NL)

9. LIST OF PUBBLICATIONS

- 1. Sato D., Davies J., Mazzotta L., Mashruk S., Valera-Medina A., Kurose R., Effects of Reynolds number and ammonia fraction on combustion characteristics of premixed ammonia-hydrogen-air swirling flames, Proceedings of the Combustion Institute, Volume 40, Issues 1–4, 2024, 105283.
- Romano C., Cerutti M., Babazzi G., Miris L., Lamioni R., Galletti C., Mazzotta L., Borello D., Ammonia blends for gas-turbines: Preliminary test and CFD-CRN modelling, Proceedings of the Combustion Institute, Volume 40, Issues 1–4, 2024, 105494.
- 3. Mazzotta, L., Lamioni, R., D'Alessio, F., Meloni, R., Morris, S., Goktepe, B., Cerutti, M., Romano, C., Creta, F., Galletti, C., Borello, D., and Valera-Medina, A., "Modeling Ammonia-Hydrogen-Air Combustion and Emission Characteristics of a Generic Swirl Burner." ASME. J. Eng. Gas Turbines Power; 146(9): 091022.
- 4. Mazzotta L., Agati G., Lamioni R., Evangelisti A., Rispoli R., Valera-Medina A. and Borello D., On the impact of CFD turbulence models for premixed NH3/H2 combustion on emissions and flame characteristics in a swirl-stabilized burner, in peer review for Flow, Turbulence and Combustion, 2024.
- 5. Mazzotta L., Zhu X., Davies J., Sato D., Borello D., Mashruk S., Guiberti T.F., Valera-Medina A., Assessing the potential of chemiluminescence-based sensors for premixed ammonia-hydrogen-air turbulent flames, in peer review for Combustion and Flame, 2024.

- 6. Davies J., Mashruk S., Sato D., Mazzotta L., Pugh D., Valera-Medina A., Emissions Analyses of Humidified 20% (vol.) Cracked Ammonia Swirling Flows, in peer review for Combustion and Flame, 2024.
- 7. Meloni R., Mazzotta L., Pucci E., Borello D., Morris S., Goktepe B., Mashruk S., Valera-Medina A., Large Eddy Simulation for the prediction of Fuel-Bound NOx Emissions: Application to NH3 and NH3-CH4 Blend at Different Operating Conditions, Proceedings of the ASME Turbo Expo 2024, London, UK.
- 8. Davies J., Mazzotta L., Sato D., Mashruk S., Kurose R., Borello D., Valera-Medina A., Experimental and Numerical Investigation Of Cracked NH3 With Stoichiometric Stratified H2 Flame In A Swirl Stabilised Burner, J. Eng. Gas Turbines Power, 2024.
- Mazzotta L., Meloni R., Lamioni R., Romano C., Numerical Investigation in a Gas Turbine Burner Operating with Hydrogen- Ammonia Blend using Large Eddy Simulation and LES-CRN Methodology, Proceedings of the 40th Meeting of the Italian Section of the Combustion Institute, Bari, 2024.
- 10. Meloni R., Babazzi G., Mazzotta L., Borello D., Analysis of the NOx formation pathways in a partially premixed burner operated with pure hydrogen, Proceedings of the 40th Meeting of the Italian Section of the Combustion Institute, Bari, 2024.
- 11. Mazzotta L., Agati G., Lamioni R., Evangelisti A., Rispoli R. and Borello D., A comparative study of different turbulence models for premixed NH3/H2 combustion in a swirl-stabilized burner, Proceedings of the 10th Symposium on Turbulence Heat and Mass transfer, 2023.
- 12. Evangelisti A., Agati G., Borello D., Mazzotta L. and Venturini P., Cavitation assessment on a model scale tidal turbine, Proceedings of the 10th Symposium on Turbulence Heat and Mass Transfer, 2023.
- 13. Lamioni R., Mazzotta L., D'Alessio F., Cerutti M., Romano C., Creta F., Borello D., and Galletti C., Ammonia to help decarbonization in gas turbine, Proceedings of the European Combustion Meeting, Rouen, 2023.
- Mazzotta, L, Di Gruttola, F, Palone, O, Gagliardi, GG, and Borello, D. "Analysis of the NOx Emissions Deriving From Hydrogen/Air Combustion in a Swirling Non-Premixed Annular Micro-Combustor." Proceedings of the ASME Turbo Expo 2022: Turbomachinery Technical Conference and Exposition. Volume 2: Coal, Biomass, Hydrogen, and Alternative Fuels; Controls, Diagnostics, and Instrumentation; Steam Turbine. Rotterdam, Netherlands. June 13–17, 2022. V002T03A009. ASME.

Rome, 03/08/2024

LUCA MAZZOTTA