

CURRICULUM VITAE

Gianluca D'Errico

Gianluca D'Errico graduated in 1997 with honors in Mechanical Engineering at the Politecnico di Milano University receiving an Award as the youngest graduate of the year in Engineering by the "Associazione Laureati".

On the 17th of January 2001 he achieved his Ph.D. in Energetics discussing his thesis: "Numerical simulation of reacting fluxes within the combustion chamber and the exhaust pipe system of S.I. engines". During his Ph.D. period he has spent an academic year (2000-01) at the Imperial College of Science and Technology in London (UK) working with Prof. David Gosman's Group.

Post-Doc researcher at the Energy Department of Politecnico di Milano working in the Internal Combustion Engine Research Group in 2010.

Assistant Professor at the Department of Energy of the Politecnico di Milano from 2002 to 2010.

Associate Professor in Fluid Machinery at the Energy Department of Politecnico di Milano from 2010 to 2016.

Full Professor in Fluid Machinery at the Energy Department of Politecnico di Milano since December 2016.

He currently teaches Internal Combustion Engine to the master course in Mechanical Engineering of the Politecnico di Milano.

SHORT DESCRIPTION OF THE RESEARCH ACTIVITY

Gianluca D'Errico's research activity is in the field of internal combustion engine modelling, with focus on the simulation of in-cylinder flows (injection, combustion and pollutant emissions) and of reacting flows along the i.c.e. duct systems. His research interests range from fundamental studies, to improve the understanding of the physical and chemical processes occurring in an internal combustion engine, to applied research, aimed at providing computational tools which can help the design of future engines. His activity is significantly oriented towards the establishment of an international collaborative network of academic and industrial institutions in the field of internal combustion engine modelling.

He coordinates a team of researchers, post-docs and Ph.D. students of the Internal Combustion Engine Group of Politecnico di Milano, who work at the development of fluid dynamic numerical codes. In particular Gianluca D'Errico, after his visiting period at the Prof. Gosman's Group at Imperial College of London in 1999, started at Politecnico di Milano the development and application of libraries and solvers using the CFD open-source code OpenFOAM. This activity has seen a growing interest over the years, progressively involving the entire research group of Internal Combustion Engine of Politecnico di Milano, and allowing the group to become the worldwide reference for the development of OpenFOAM based "engine applications". This leadership is witness by the role played in the OpenFOAM community (i.e. in 2008 Gianluca D'Errico organized in Milan the Third OpenFOAM workshop with 250 participants from 30 different countries and then he contributed to the other workshops) and by the numerous industrial and academic collaborations which he carries out. With regard to this latter issue, it can be remarked that every year he supervises in Milan several (3-4 per year) visiting Ph.D. students from different institutions (Aalto University, Chalmers, Freiburg University, The University of Nottingham, University of Louvain, University of New South Wales, ..). Since 2011, he is involved in the organization of the Engine Combustion Network, an open forum for international collaboration

among experimental and computational researchers in engine combustion promoted by the Sandia National Laboratories. Since 2016, he is one of the organizers of the Multi-Dimensional session of the SAE World Congress, which is one of the most recognized conference sessions in the area of internal combustion engine modeling.

The two main research areas in which he mostly contributed are the following:

1) The thermo-fluid dynamic modelling of the internal combustion engines and 1D simulation of the unsteady reacting flows along the exhaust systems. He has carried out this activity since the beginning of his scientific career (1998), putting his efforts into a numerical code, GASDYN, which was entirely developed within his research unit and which is internationally well known and appreciated nowadays. This code is able to describe the performances and emissions of aspirated and turbocharged S.I., Diesel and HCCI engines. Some of Gianluca's most relevant contributions are:

- the development of a fluid dynamic model for transport and reaction of chemical species along the exhaust duct systems;
- the prediction of the different combustion processes by means of novel and original thermodynamic models;
- the study of spark ignition engines with gaseous fuels, including hydrogen;
- the use of very detailed chemistry in thermodynamic approaches (knock and HCCI operation);
- the development of integrated 1D-3D fluid dynamic models.

2) The CFD analysis of the injection and combustion processes in S.I, Diesel and HCCI engines.

Main themes and contributions are:

- the definition of a new moving mesh methodology, which includes topological changes too, to be applied for the simulation of complex geometries as real engines;
- the development of a Lagrangian model for the fuel spray in GDI and Diesel engines, including atomization, break-up, evaporation and wall-film impingement sub-models.
- the definition of efficient numerical techniques to integrate complex chemistry in a CFD approach: ISAT (In-Situ Adaptive Tabulation), CCM (Chemistry Coordinate Mapping) algorithms, RIF (Representative Interactive Flamelets), CMC (Conditional Moment Closure).
- the study the Diesel spray and flame structure and the coordination of the modeling activity of the Engine Combustion Network.

SCIENTIFIC PARTECIPATION FOR INTERNATIONAL RESEARCH PROJECTS:

UPGRADE (Unit coordinator) 2016-2019, IMPERIUM (Unit coordinator) 2016-2019, - HDGAS 2016-2019, HERCULES-2 2015-2019, LESSCCV 2009-2012, SIMBA 2008-2011

MAIN INDUSTRIAL and ACCADEMIC COLLABORATIONS

Gianluca D'Errico is responsible or co-responsible of the research contracts of the Internal Combustion Engine Group of Politecnico di Milano, whose global funding is about 400 000 Euro per year. Currently he carrying on funded research collaborations with Exothermia (Greece), FIAT PowerTrain Industrial (Italy), IAV (Germany), John Deere (USA), Nissan (Japan), Volvo Group Trucks Technology (Sweden).

Among the most recent academic collaborations, the following can be listed: Argonne National Laboratories, Chalmers University, The Eindhoven University of Technology, Sandia National Laboratories, University of Brussel, University of Exeter, University of New South Wales

PUBLICATIONS AND AREAS OF RESEARCH

He is author of more than 100 papers, half of which on international journals and the others being published in international peer reviewed conferences. He has 108 documents indexed in Scopus and an h-index equal to 24, with a total of 1709 citations (as October 10, 2020).