

## **Professor Angelo Onorati**

Dipartimento di Energia,  
Politecnico di Milano,  
Campus Bovisa, Via Lambruschini 4, 20156 Milano - Italy  
Tel. +39 02 2399 8416  
Fax. +39 02 2399 3913  
E-mail: [angelo.onorati@polimi.it](mailto:angelo.onorati@polimi.it)  
Web site: [www.engines.polimi.it](http://www.engines.polimi.it)

### **Education:**

Graduated "cum laude" in Mechanical Engineering at Politecnico di Milano in 1989, discussing a thesis about the modeling of turbocharged I.C. engines.

PhD in "Energy" in 1993 at Politecnico di Milano; the thesis work was focused on the simulation of the gas dynamic behavior of I.C. engine silencers. During the PhD he spent a research stay at the University of Manchester Institute of Science and Technology (UMIST) and the Institute of Sound and Vibration Research (ISVR) at Southampton (GB).

### **Main steps in academic career and work experiences:**

Lecturer at the Department of Energy of Politecnico di Milano ("Fluid Machines" field) from 1993 to 1998.

Associate Professor in the same department from 1998 to 2003.

Full Professor of "Fluid Machines" since January 2004.

He gives lectures in the course of "Fluid Machines" (200 students) at the 3<sup>rd</sup> year of the BSc in Energy Engineering, and in the courses of "Internal Combustion Engines" (140 students) and "Energy Systems" (50 students) at MSc level (mechanical and energy engineering), last year.

He currently coordinates the research activity of the ICE Group at the Department of Energy: 5 professors, 3 assistant professors, 9 PhD students. The research group is involved in several research projects with universities and industries, mainly in the field of IC engines and Fluid Machines in general. He is the tutor of 5 PhD students and 10 MSc thesis per year.

He develops and coordinates the evolution of an integrated 1D-3D thermo-fluid dynamic model (GASDYN-OpenFOAM) for the simulation of I.C. engines, to calculate the unsteady reacting flows in the intake and exhaust systems (including catalytic converters, particulate filters and silencers), and the combustion process in Otto, Diesel and HCCI engines.

He started many research collaborations with universities and automotive companies for the application and enhancement of the 1D-3D thermo-fluid dynamic codes developed by the research group.

He has been the scientific coordinator of research projects financed by the Ministry of Education (FIRB), the Ministry of Industry (Industria 2015), the European Community (LESSCCV, FP7), concerning advanced CFD simulation techniques for innovative vehicle I.C. engines.

He is the author of 121 publications reported on Scopus, with 1165 citations and h-index = 18.

## **Personal skills and research interests:**

His research interests are concerned with the modeling of internal combustion engines by means Gasdyn (1D code) and OpenFOAM (multidimensional CFD code).

Thermo-fluid dynamic modeling of unsteady reacting flows in the duct-systems of I.C. engines.

CFD simulation of after-treatment systems for I.C. engines: catalytic converters, particulate filters.

CFD modeling of silencers and prediction of tailpipe noise emitted by I.C. engines.

Study of advanced combustion processes in I.C. engines fuelled with natural gas, hydrogen, bio-fuels.

Modeling of downsized, turbo-charged engines.

Integrated 1D-3D thermo-fluid dynamic simulation of I.C. engines.

## **Awards:**

In April 2011 he received the Lloyd L. Withrow distinguished speaker SAE award.

## **Responsibilities:**

Member of the Editorial Board of the International Journal of Engine Research.  
Associate Editor of the Editorial Board of the SAE International Journal of Engines.

Organizer of the session "Modeling of S.I. and Diesel Engines" of the SAE World Congress.  
Member of the scientific committee of the THIESEL International Conference on Diesel engines, held in Valencia (Spain) every two years.  
Member of the scientific committee of the SAE ICE International Conference, held in Capri (Naples – Italy) every two years.

Coordinator of the "Fluid Machines and Energy Systems" division in the Department of Energy.  
Coordinator of the Erasmus/Time international student programs for Energy Engineering.  
Member of the faculty international committee.

## **Reviewer for the following scientific journals:**

SAE Journals  
Progress in Energy and Combustion Science  
International Journal for Numerical Methods in Engineering  
Computer Physics Communications  
Journal of Automobile Engineering  
International Journal of Engine Research  
International Journal of Vehicle Design

International Journal of Hydrogen Energy  
Fuel  
Energy  
Applied Energy

## Memberships:

Member of SAE (Society of Automotive Engineers).

Member of SAE-Naples Governing Board.

He is involved in the editorial board of the IJER (international Journal of Engine Research) and the SAE Int. Journal of Engines.

## Selected Publications:

Lucchini, T., Della Torre, A., D'Errico, G., Onorati, A., Maes, N., Somers, L.M.T., Hardy, G., A comprehensive methodology for computational fluid dynamics combustion modeling of industrial diesel engines. (2017) International Journal of Engine Research, 18 (1-2), pp. 26-38.

Giussani, F., Montorfano, A., Piscaglia, F., Onorati, A., Hélie, J., Aithal, S.M., Dynamic VOF Modelling of the Internal Flow in GDI Fuel Injectors. (2016) Energy Procedia, 101, pp. 574-581.

Della Torre, A., Lucci, F., Montenegro, G., Onorati, A., Dimopoulos Eggenschwiler, P., Tronconi, E., Groppi, G., CFD modeling of catalytic reactions in open-cell foam substrates. (2016) Computers and Chemical Engineering, 92, pp. 55-63.

Della Torre, A., Montenegro, G., Onorati, A., CFD investigation of the effect of fluid-structure interaction on the transmission loss of ICE silencers. (2016) SAE International Journal of Passenger Cars - Mechanical Systems, 9 (3),

Zhu, X., Sforza, L., Ranadive, T., Zhang, A., Lee, S.-Y., Naber, J., Lucchini, T., Onorati, A., Anbarasu, M., Zeng, Y., Experimental and Numerical Study of Flame Kernel Formation Processes of Propane-Air Mixture in a Pressurized Combustion Vessel. (2016) SAE International Journal of Engines, 9 (3).

Montenegro, G., Cerri, T., Torre, A., Onorati, A., Fiocco, M., Borghesi, D., Fluid dynamic optimization of a moto3™ engine by means of 1D and 1D-3D simulations. (2016) SAE International Journal of Engines, 9 (1), pp. 596-608.

Maghbouli, A., Lucchini, T., D'Errico, G., Onorati, A., Effects of grid alignment on modeling the spray and mixing process in direct injection diesel engines under non-reacting operating conditions (2015) Applied Thermal Engineering, 91, pp. 901-912.

Martínez, J., Piscaglia, F., Montorfano, A., Onorati, A., Aithal, S.M., Influence of momentum interpolation methods on the accuracy and convergence of pressure-velocity coupling algorithms in OpenFOAM®. (2015) Journal of Computational and Applied Mathematics.

Martínez, J., Piscaglia, F., Montorfano, A., Onorati, A., Aithal, S.M., Influence of spatial discretization schemes on accuracy of explicit LES: Canonical problems to engine-like geometries. (2015) Computers and Fluids, 117, pp. 62-78.

Cheng, W.K., Onorati, A., Editorial: Biofuels in internal combustion engines. (2015) International Journal of Engine Research, 16 (5), p. 609.

Piscaglia, F., Montorfano, A., Onorati, A., A Scale Adaptive Filtering Technique for Turbulence Modeling of Unsteady Flows in IC Engines. (2015) SAE International Journal of Engines, 8 (2), pp. 426-436.

Stockar, S., Canova, M., Guezennec, Y., Della Torre, A., Montenegro, G., Onorati, A., Model-order reduction for wave propagation dynamics in internal combustion engine air path systems. (2015) International Journal of Engine Research, 16 (4), pp. 547-564.

- Frassoldati, A., D'Errico, G., Lucchini, T., Stagni, A., Cuoci, A., Faravelli, T., Onorati, A., Ranzi, E., Reduced kinetic mechanisms of diesel fuel surrogate for engine CFD simulations. (2015) *Combustion and Flame*, 162 (10), pp. 3991-4007.
- D'Errico, G., Lucchini, T., Onorati, A., Hardy, G., Computational fluid dynamics modeling of combustion in heavy-duty diesel engines. (2015) *International Journal of Engine Research*, 16 (1), pp. 112-124.
- Montorfano, A., Piscaglia, F., Schmitt, M., Wright, Y.M., Frouzakis, C.E., Tomboulides, A.G., Boulouchos, K., Onorati, A., Comparison of Direct and Large Eddy Simulations of the Turbulent Flow in a Valve/Piston Assembly. (2015) *Flow, Turbulence and Combustion*, 95 (2-3), pp. 461-480.
- Lucchini, T., D'Errico, G., Onorati, A., Bonandrini, G., Venturoli, L., Di Gioia, R. Development and application of a computational fluid dynamics methodology to predict fuel-air mixing and sources of soot formation in gasoline direct injection engines. (2014) *International Journal of Engine Research*, 15 (5), pp. 581-596.
- F. Piscaglia, A. Montorfano, A. Onorati, Development of a non-reflecting boundary condition for multi-dimensional non linear duct acoustic computation. (2013) *Journal of Sound and Vibration* 332 (4), pp. 922-935.
- G. Montenegro, A. Onorati, A. Della Torre, The prediction of silencer acoustical performances by 1D, 1D-3D and quasi-3D non-linear approaches, *Computers and Fluids* 71, pp. 208-223, 2013.
- G. Montenegro, A. Della Torre, A. Onorati, and R. Fairbrother, A Nonlinear Quasi-3D Approach for the Modeling of Mufflers with Perforated Elements and Sound-Absorbing Material, *Advances in Acoustics and Vibration*, vol. 2013, 2013. doi:10.1155/2013/546120, Hindawi.
- S. Stockar, M. Canova, Y. Guezennec, A. Della Torre, G. Montenegro, A. Onorati, Modeling Wave Action Effects in IC Engine Air Path Systems: Comparison of Numerical and System Dynamics. *Int. J. Eng. Research* 2012.
- H. M. Ismail, H. K. Ng, S. Gan, T. Lucchini, A. Onorati, Development of a reduced biodiesel combustion kinetics mechanism for CFD modelling of a light-duty diesel engine (2012) *Fuel*, Article in Press, 2013.
- G. Montenegro, A. Della Torre, A. Onorati, A. J. Torregrosa, The 3DCell Approach for the Acoustic Modeling of After-Treatment Devices. SAE Paper 2011-24-0215, ICE2011, 10th International Conference on Engines and Vehicles, September 13th-18th, Capri (Naples), 2011. *SAE Int. J. Engines* August 2011, 4:2519-2530, doi:10.4271/2011-24-0215.