



UNIMORE
UNIVERSITÀ DEGLI STUDI DI
MODENA E REGGIO EMILIA

UNIVERSITÀ DEGLI STUDI DI MODENA E REGGIO EMILIA

Prof. Stefano Fontanesi

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CURRICULUM VITAE

POSIZIONE ATTUALE

Professore Associato presso il Dipartimento di Ingegneria "Enzo Ferrari" dell'università di Modena e Reggio Emilia. SSD ING-IND/08 "Macchine a fluido". Data di presa di servizio: 31-10-2015.

Dal 01/01/2022: Presidente del Consiglio di Corso di Studi per i corsi di Laurea Triennale e Laurea Magistrale in Ingegneria del Veicolo

STUDI E FORMAZIONE

1992: diploma di maturità scientifica presso il Liceo "L. Spallanzani" di Reggio Emilia con votazione 60/60.

21/10/1999: laurea in Ingegneria Meccanica presso l'Università degli Studi di Modena e Reggio Emilia con votazione 110/110 e lode. Tesi in Motori a combustione interna: "Analisi numerico - sperimentale del "matching" in motori Diesel automobilistici" in collaborazione con VM Motori S.p.A. di Cento (FE).

26/02/2003: titolo di Dottore di Ricerca in Ingegneria dei Materiali presso l'Università degli Studi di Modena e Reggio Emilia, Curriculum: Materiali per la Meccanica, Titolo della Tesi: "Analisi numerico - sperimentale delle prestazioni di motori ad elevata potenza specifica".

01/11/2007: ricercatore presso il Dipartimento di Ingegneria "Enzo Ferrari" dell'università di Modena e Reggio Emilia. SSD ING-IND/08 "Macchine a fluido".

LINGUE STRANIERE

Inglese	parlato	OTTIMO
	scritto	OTTIMO
Spagnolo	parlato	BUONO
	scritto	DISCRETO

ATTIVITÀ DIDATTICA

Dal 2002, titolare del corso "Simulazione Fluidodinamica di Sistemi Propulsivi" (in precedenza "Simulazione Fluidodinamica di Motori a Combustione Interna") al 2° (ultimo) anno della Laurea Magistrale in Ingegneria del Veicolo presso l'Università di Modena e Reggio Emilia.

Dal 2022, titolare del corso "Fondamenti di Macchine e Motori" al 3° (ultimo) anno della Laurea Triennale in Ingegneria del Veicolo presso l'Università di Modena e Reggio Emilia.

Dal 2020 al 2023, titolare del Corso in lingua inglese "Design and Modelling of High Performance Combustion Systems" al 2° (ultimo) anno della Laurea Magistrale Interateneo in Advanced Automotive Engineering, Curriculum Advance Powertrain



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Ingegneria Modena
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"Enzo Ferrari"

Dal 2007 al 2014, titolare del corso "Macchine e Sistemi Energetici" al 3° (ultimo) anno della Laurea Triennale in Ingegneria del Veicolo presso l'Università di Modena e Reggio Emilia.
Dal 2001, corsi brevi su "Fondamenti di Motori a Combustione Interna" e "simulazione CFD di Motori a Combustione Interna" al Master Post-Laurea di II livello in Ingegneria del Veicolo all'Università di Modena e Reggio Emilia.

RICERCA

Dal 2007, responsabile scientifico del "GRUMO – GRUpPoMOTORI", il gruppo di ricerca sui motori a combustione interna dell'Università di Modena e Reggio Emilia.

Principali linee di ricerca:

- Simulazione di flussi turbolenti tramite RANS, SAS e LES
- Simulazione RANS e LES della combustione turbolenta nei MCI, sia AC che AS
- Modellazione avanzata di combustione anomala, con particolare riferimento alla modellazione della detonazione
- Modellazione dello scambio termico a parete in MCI e delle sollecitazioni termomeccaniche in component motore
- Modellazione di spray combustibile e fenomeni correlate (rottura primaria e secondaria, evaporazione, interazione a parete)
- Modellazione della chimica di combustibili convenzionali ed alternativi e sviluppo di soluzioni a costo computazionale ridotto per incorporare informazioni chimiche di dettaglio in simulazioni 3D-CFD
- Modellazione fluidodinamica ed elettrochimica di celle a combustibile di tipo PEM
- Modellazione di soluzioni fluidodinamiche innovative realizzate in additive manufacturing
- Modellazione del comportamento di getti di idrogeno, miscelamento idrogeno/aria e combustione di miscele idrogeno/aria in motori ad alta efficienza e/o ad altissima Potenza specifica

Attuali/recenti collaborazioni di ricerca industriale:

- Ferrari (Italy)
- Ferrari Gestione Sportiva (F1 Team) (Italy)
- FCA (Italy)
- Maserati (Italy)
- Alfa Romeo (Italy)
- Daimler (Germany)
- AUDI (Germany)
- GM (USA)
- TMG – Toyota Motorsport (Germany)
- Winterthur Gas & Diesel (Switzerland)
- Kohler (Italy)
- Caprari (Italy)
- EMAK (Italy)



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- Friendship Systems (Germany)

Technical Expert per SIEMENS DISW per lo sviluppo di modellistica fluidodinamica per interno-cilindro

Co-fondatore di "R&D CFD Srl", un'azienda di engineering service situate a Modena, precedentemente Spin-Off company dell'Università di Modena e Reggio Emilia

Attuali/recenti collaborazioni scientifiche con:

- Seoul National University, prof. Kyoungdoug Min
- STEMS, National Research Council, Dr. Simona S. Merola, Dr. Bianca Vaglieco
- Université de Orléans, Laboratoire Prisme, prof. Fabrice Foucher
- University of Oxford, Prof. Martin Davy and Prof. Felix Leach

Autore di circa 150 pubblicazioni scientifiche, in particolare sulla modellazione CFD di Motori a Combustione Interna. La maggior parte delle pubblicazioni è su peer-reviewed journals internazionali o conferenze internazionali con peer review.

ATTIVITÀ EDITORIALE

Associate editor del "SAE International Journal of Engines" dal 2017.

PREMI/RICONOSCIMENTI

Premio "Forest R. McFarland Award" nel 2020 per il prolungato ed eccezionale contributo alle attività di SAE (Society of Automotive Engineers) International

INDICI BIBLIOMETRICI

Attuale Scopus h-index: 32

Citazioni: >2600

ORCID: 0000-0002-3303-4229

PUBBLICAZIONI RECENTI

DAL 2015, IN GRASSETTO LE PUBBLICAZIONI SU RIVISTA

1. Fontanesi, S.; D'Adamo, A.; Rutland, C. J., "Large-Eddy simulation analysis of spark configuration effect on cycle-to-cycle variability of combustion and knock", *International Journal of Engine Research* - ISSN:1468-0874 vol. 16, pp.403-418, 2015, <https://doi.org/10.1177/1468087414566253>
2. d'Adamo, A., Berni, F., Breda, S., Lugli, M. et al., "A Numerical Investigation on the Potentials of Water Injection as a Fuel Efficiency Enhancer in Highly Downsized GDI Engines," *SAE Technical Paper* 2015-01-0393, 2015, <https://doi.org/10.4271/2015-01-0393>



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3. Giovannoni Nicola, Breda Sebastiano, Paltrinieri Stefano, D'Adamo Alessandro, Fontanesi Stefano, Pulvirenti Francesco (2015). CFD Analysis of the Effects of Fuel Composition and Injection Strategy on Mixture Preparation and Fuel Deposit Formation in a GDI Engine. SAE Technical Paper 2015-24-2408, 2015, ISSN: 0148-7191, <https://doi.org/10.4271/2015-24-2408>
4. Berni Fabio, Breda Sebastiano, D'Adamo Alessandro, Fontanesi Stefano, Cantore Giuseppe (2015). Numerical Investigation on the Effects of Water/Methanol Injection as Knock Suppressor to Increase the Fuel Efficiency of a Highly Downsized GDI Engine. SAE Technical Paper 2015-24-2999, 2015, ISSN: 0148-7191, <https://doi.org/10.4271/2015-24-2499>
5. D'Adamo Alessandro, Breda Sebastiano, Fontanesi Stefano, Cantore Giuseppe (2016). A RANS-Based CFD Model to Predict the Statistical Occurrence of Knock in Spark-Ignition Engines. SAE Int. J. Engines Vol. 9, p. 626-638, ISSN: 1946-3944, <https://doi.org/10.4271/2016-01-0581>
6. Breda Sebastiano, D'Adamo Alessandro, Fontanesi Stefano, Giovannoni Nicola, Testa Francesco, Irimescu Adrian, Merola Simona, Tornatore Cinzia, Valentino Gerardo (2016). CFD Analysis of Combustion and Knock in an Optically Accessible GDI Engine. SAE Int. J. Engines Vol. 9, p. 649-664, ISSN: 1946-3944, <https://doi.org/10.4271/2016-01-0601>
7. De Bellis Vincenzo, Bozza Fabio, Fontanesi Stefano, Severi Elena, Berni Fabio (2016). Development of a phenomenological turbulence model through a hierarchical 1D/3D approach applied to a VVA turbocharged engine. SAE Int. J. Engines Vol. 9, p. 506-519, ISSN: 1946-3936, <https://doi.org/10.4271/2016-01-0545>
8. Testa Francesco, Gagliardi Vincenzo, Ferrari Marco, Fontanesi Stefano, Bertani Andrea (2016). Guidelines for the optimization of a muffler in a small two stroke engine. SAE Int. J. Engines Vol. 9, p. 2416-2426, ISSN: 1946-3944, <https://doi.org/10.4271/2016-32-0050>
9. Cicalese Giuseppe, Berni Fabio, Fontanesi Stefano (2016). Integrated In-Cylinder / CHT Methodology for the Simulation of the Engine Thermal Field: An Application to High Performance Turbocharged DISI Engines. SAE Int. J. Engines Vol. 9, p. 609-625, ISSN: 1946-3944, <https://doi.org/10.4271/2016-01-0578>
10. D'Adamo Alessandro, Breda Sebastiano, Fontanesi Stefano, Cantore Giuseppe (2015). LES Modelling of Spark-Ignition Cycle-to-Cycle Variability on a Highly Downsized DISI Engine. SAE Int. J. Engines Vol. 8, p. 2029-2041, ISSN: 1946-3944, <https://doi.org/10.4271/2015-24-2403>
11. D'Adamo Alessandro, Breda Sebastiano, Fontanesi Stefano, Irimescu Adrian, Merola Simona Silvia, Tornatore Cinzia (2017). A RANS knock model to predict the statistical occurrence of engine knock. Applied Energy, Vol. 191, p. 251-263, ISSN: 0306-2619, <https://doi.org/10.1016/j.apenergy.2017.01.101>
12. Berni Fabio, Cicalese Giuseppe, Fontanesi Stefano (2017). A modified thermal wall function for the estimation of gas-to-wall heat fluxes in CFD in-cylinder simulations of high performance



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- spark-ignition engines. *Applied Thermal Engineering*, Vol. 115, p. 1045-1062, ISSN: 1359-4311, <https://doi.org/10.1016/j.applthermaleng.2017.01.055>
13. Berni Fabio, Fontanesi Stefano, Cicalese Giuseppe, D'Adamo Alessandro (2017). Critical aspects on the use of thermal wall functions in CFD in-cylinder simulations of spark-ignition engines. *SAE Int. J. Commercial Vehicles* Vol. 10, p. 1-15, ISSN: 1946-391X, <https://doi.org/10.4271/2017-01-0569>
 14. D'Adamo Alessandro, Breda Sebastiano, Iaccarino Salvatore, Berni Fabio, Fontanesi Stefano, Zardin Barbara, Borghi Massimo, Irimescu Adrian, Merola Simona (2017). Development of a RANS-Based Knock Model to Infer the Knock Probability in a Research Spark-Ignition Engine. *SAE Int. J. Engines* Vol. 10, p. 1-18, ISSN: 1946-3936, <https://doi.org/10.4271/2017-01-0551>
 15. Iaccarino Salvatore, Breda Sebastiano, D'Adamo Alessandro, Fontanesi Stefano, Irimescu Adrian, Merola Simona (2017). Numerical Simulation and Flame Analysis of Combustion and Knock in a DISI Optically Accessible Research Engine. *SAE Int. J. Engines* Vol. 10, p. 576-592, ISSN: 1946-3944, <https://doi.org/10.4271/2017-01-0555>
 16. Cavicchi Andrea, Postriotti Lucio, Giovannoni Nicola, Fontanesi Stefano, Bonandrini Giovanni, Di Gioia Rita (2017). Numerical and experimental analysis of the spray momentum flux measuring on a GDI injector. *Fuel*, Vol. 206, p. 614-627, ISSN: 0016-2361, <https://doi.org/10.1016/j.fuel.2017.06.054>
 17. Breda Sebastiano, D'Adamo Alessandro, Fontanesi Stefano, D'Orrico Fabrizio, Irimescu Adrian, Merola Simona, Giovannoni Nicola (2017). Numerical simulation of gasoline and n-butanol combustion in an optically accessible research engine. *SAE Int. J. Engines* Vol. 10, p. 32-55, ISSN: 1946-3936, <https://doi.org/10.4271/2017-01-0546>
 18. Zardin Barbara, Cillo Giovanni, Borghi Massimo, D'Adamo Alessandro, Fontanesi Stefano (2017). Pressure Losses in Multiple-Elbow Paths and in V-Bends of Hydraulic Manifolds. *Energies*, Vol. 10, p. 1-21, ISSN: 1996-1073, <https://doi.org/10.3390/en10060788>
 19. Ko Insuk, D'Adamo Alessandro, Fontanesi Stefano, Min Kyoungdoug (2017). Study of les Quality Criteria in a Motored Internal Combustion Engine. In: *SAE World Congress Experience, WCX 2017*. Sae Technical Paper 2017-01-0549, 2017, <https://doi.org/10.4271/2017-01-0549>
 20. Cicalese, G., Berni, F., Fontanesi, S., D'Adamo, A. et al., "A Comprehensive CFD-CHT Methodology for the Characterization of a Diesel Engine: from the Heat Transfer Prediction to the Thermal Field Evaluation," *SAE Technical Paper* 2017-01-2196, 2017, <https://doi.org/10.4271/2017-01-2196>
 21. D'Adamo, A., Del Pecchia, M., Breda, S., Berni, F. et al., "Chemistry-Based Laminar Flame Speed Correlations for a Wide Range of Engine Conditions for Iso-Octane, n-Heptane, Toluene and Gasoline Surrogate Fuels," *SAE Technical Paper* 2017-01-2190, 2017, <https://doi.org/10.4271/2017-01-2190>



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22. **Y. Shekhawat, D.C. Haworth, A. d'Adamo, F. Berni, S. Fontanesi, P. Schiffmann, D.L. Reuss and V. Sick, Oil & Gas Science and Technology - Rev. IFP Energies nouvelles, 72 5 (2017) 32, DOI: <https://doi.org/10.2516/ogst/2017028>**
23. Postriotti, L., Cavicchi, A., Brizi, G., Berni, F. et al., "Experimental and Numerical Analysis of Spray Evolution, Hydraulics and Atomization for a 60 MPa Injection Pressure GDI System," SAE Technical Paper 2018-01-0271, 2018, <https://doi.org/10.4271/2018-01-0271>
24. Bozza, F., Teodosio, L., De Bellis, V., Fontanesi, S. et al., "Refinement of a 0D Turbulence Model to Predict Tumble and Turbulent Intensity in SI Engines. Part II: Model Concept, Validation and Discussion," SAE Technical Paper 2018-01-0856, 2018, <https://doi.org/10.4271/2018-01-0856>
25. **Del Pecchia, M., Breda, S., D'Adamo, A., Fontanesi, S. et al., "Development of Chemistry-Based Laminar Flame Speed Correlation for Part-Load SI Conditions and Validation in a GDI Research Engine," SAE Int. J. Engines 11(6):715-741, 2018, <https://doi.org/10.4271/2018-01-0174>**
26. Ko, I., Min, K., Fontanesi, S., Rulli, F. et al., "Impact of Grid Density on the LES Analysis of Flow CCV: Application to the TCC-III Engine under Motored Conditions," SAE Technical Paper 2018-01-0203, 2018, <https://doi.org/10.4271/2018-01-0203>
27. **D'Adamo, A., Breda, S., Berni, F., Fontanesi, S., "Understanding the origin of cycle-to-cycle variation using large-eddy simulation: Similarities and differences between a homogeneous low-revving speed research engine and a production DI turbocharged engine", (2018) SAE International Journal of Engines, 12 (1), pp. 1-22. <https://doi.org/10.4271/03-12-01-0007>**
28. Postriotti, L., Cavicchi, A., Brizi, G., Berni, F., Fontanesi, S., "Experimental and Numerical Analysis of Spray Evolution, Hydraulics and Atomization for a 60 MPa Injection Pressure GDI System", (2018) SAE Technical Papers, 2018-April. DOI: 10.4271/2018-01-0271
29. Bozza, F., Teodosio, L., De Bellis, V., Fontanesi, S., Iorio, A., "Refinement of a 0D Turbulence Model to Predict Tumble and Turbulent Intensity in SI Engines. Part II: Model Concept, Validation and Discussion", (2018) SAE Technical Papers, 2018-April, DOI: 10.4271/2018-01-0856
30. **Breda, S., D'Orrico, F., Berni, F., d'Adamo, A., Fontanesi, S., Irimescu, A., Merola, S.S., "Experimental and numerical study on the adoption of split injection strategies to improve air-butanol mixture formation in a DISI optical engine", (2019) Fuel, 243, pp. 104-124., <https://doi.org/10.1016/j.fuel.2019.01.111>**
31. **Bozza, F., Teodosio, L., De Bellis, V., Fontanesi, S. et al., "A Refined 0D Turbulence Model to Predict Tumble and Turbulence in SI Engines," SAE Int. J. Engines 12(1):2019, <https://doi.org/10.4271/03-12-01-0002>**
32. **d'Adamo, A., Breda, S., Berni, F., Fontanesi, S., "The potential of statistical RANS to predict knock tendency: Comparison with LES and experiments on a spark-ignition engine", (2019) Applied Energy, 249, pp. 126-142. <https://doi.org/10.1016/j.apenergy.2019.04.093>**



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33. Barbato, A., Rulli, F., Fontanesi, S., D'Adamo, A., Berni, F., Cicalese, G., Perrone, A., "A comparison between different moving grid techniques for the analysis of the TCC engine under motored conditions", (2019) SAE Technical Paper 2019-01-0218, 2019, <https://doi.org/10.4271/2019-01-0218>
34. Krastev, V., D'adamo, A., Rulli, F., Fontanesi, S., "Effects of the domain zonal decomposition on the hybrid URANS/les modeling of the TCC-III motored engine flow", (2019) SAE Technical Paper 2019-24-0097, 2019, <https://doi.org/10.4271/2019-24-0097>
35. Krastev, V.K., d'Adamo, A., Berni, F., Fontanesi, S., "Validation of a zonal hybrid URANS/LES turbulence modeling method for multi-cycle engine flow simulation" (2019) **International Journal of Engine Research**. <https://doi.org/10.1177/1468087419851905>
36. Cavicchi, A., Sparacino, S., Berni, F., Postriotti, L., Fontanesi, S., "Evaluation of the single jet flow rate for a multi-hole GDI nozzle", (2019) AIP Conference Proceedings, 2191, <https://doi.org/10.1063/1.5138776>
37. Del Pecchia, M., Pessina, V., Berni, F., d'Adamo, A., Fontanesi, S. "Gasoline-ethanol blend formulation to mimic laminar flame speed and auto-ignition quality in automotive engines", (2020) **Fuel**, 264, <https://doi.org/10.1016/j.fuel.2019.116741>
38. Del Pecchia, M., Fontanesi, S., Prager, J., Kralj, C., Lehtiniemi, H. "A threshold soot index-based fuel surrogate formulation methodology to mimic sooting tendency of real fuels in 3D-CFD simulations" **Applied Energy**, 2020, 280, 115909, <https://doi.org/10.1016/j.apenergy.2020.115909>
39. Cavicchi, A., Postriotti, L., Berni, F., Fontanesi, S., Di Gioia, R., "Evaluation of hole-specific injection rate based on momentum flux measurement in GDI systems", (2020) **Fuel**, 263, <https://doi.org/10.1016/j.fuel.2019.116657>
40. d'Adamo A., Iacovano C., Fontanesi S. (2020) "Large-Eddy simulation of lean and ultra-lean combustion using advanced ignition modelling in a transparent combustion chamber engine". **Applied Energy**, Volume 280, 2020, 115949 <https://doi.org/10.1016/j.apenergy.2020.115949>
41. Del Pecchia, M., Fontanesi, S. "A methodology to formulate multicomponent fuel surrogates to model flame propagation and ignition delay" **Fuel**, 2020, 279, 118337, <https://doi.org/10.1016/j.fuel.2020.118337>
42. Iacovano, C., Berni, F., Barbato, A., Fontanesi, S. "A Preliminary 1D-3D Analysis of the Darmstadt Research Engine under Motored Condition" **E3S Web of Conferences**, 2020, 197, 06006, <https://doi.org/10.1051/e3sconf/202019706006>
43. Krastev, V.K., Di Ilio, G., Iacovano, C., D'Adamo, A., Fontanesi, S. "Standard and consistent Detached-Eddy Simulation for turbulent engine flow modeling: An application to the TCC-III engine" **E3S Web of Conferences**, 2020, 197, 06021, <https://doi.org/10.1051/e3sconf/202019706021>
44. Riccardi, M., D'Adamo, A., Vaini, A., ...Borghini, M., Fontanesi, S. "Experimental Validation of a 3D-CFD Model of a PEM Fuel Cell" **E3S Web of Conferences**, 2020, 197, 05004, <https://doi.org/10.1051/e3sconf/202019705004>



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46. **Berni, F., Fontanesi, S. "A 3D-CFD methodology to investigate boundary layers and assess the applicability of wall functions in actual industrial problems: A focus on in-cylinder simulations" Applied Thermal Engineering, 2020, 174, 115320, <https://doi.org/10.1016/j.applthermaleng.2020.115320>**
47. Del Pecchia, M., Sparacino, S., Pessina, V., ...Irimescu, A., Di Iorio, S. "Development of a Sectional Soot Model Based Methodology for the Prediction of Soot Engine-Out Emissions in GDI Units" SAE Technical Paper 2020-01-0239, 2020, <https://doi.org/10.4271/2020-01-0239>
48. **Ko, I., Rulli, F., Fontanesi, S., d'Adamo, A., Min, K. "Methodology for the large-eddy simulation and particle image velocimetry analysis of large-scale flow structures on TCC-III engine under motored condition" International Journal of Engine Research, 2020, <https://doi.org/10.1177/1468087420934599>**
49. **Iacovano, C., d'Adamo, A., Fontanesi, S., Di Ilio, G., Krastev, V.K. "Application of a zonal hybrid URANS/LES turbulence model to high and low-resolution grids for engine simulation" International Journal of Engine Research, 2020, <https://doi.org/10.1177/1468087420931712>**
50. **Berni, F., Cicalese, G., Borghi, M., Fontanesi, S. "Towards grid-independent 3D-CFD wall-function-based heat transfer models for complex industrial flows with focus on in-cylinder simulations" Applied Thermal Engineering, 2021, 190, 116838, <https://doi.org/10.1016/j.applthermaleng.2021.116838>**
51. **Rulli, F., Barbato, A., Fontanesi, S., d'Adamo, A. "Large eddy simulation analysis of the turbulent flow in an optically accessible internal combustion engine using the overset mesh technique" International Journal of Engine Research, 2021, 22(5), pp. 1440-1456, <https://doi.org/10.1177/1468087419896469>**
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