Curriculum Vitae

Personal Information

Name and Surname **Fabio Berni**

E-mail fabio.berni@unimore.it

Work Experience

3/2020 – 12/2020 **Senior CFD analyst at Ferrari s.p.a.**
3D-CFD analyses of innovative exhaust after-treatment systems.

11/2017 – 12/2020 **Senior CFD analyst at R&D CFD s.r.l.**
Consultant for national and international automotive companies on the development of methodologies for 3D-CFD simulations.

Research Activity

1/2022 to date **Assistant Professor**
Lecturer in different courses (both in Italian and English) and engaged in multiple research activities .

1/2021-12/2021 **Research Fellow**
Research on heat transfer (and thermal management), multi-phase flows and e-fuels.

2014 to date **Research Topics**

- Innovative heat exchangers based on lattice structures
- Combustion of e-fuels (ammonia, hydrogen, etc.)
- Heat transfer in ICEs
- Emission modeling
- Lagrangian spray modeling

Teaching

1/2022 to date
- Lecturer of the course titled “Machines and Energy Systems” in the Environmental Engineering degree course.
- Lecturer of the course titled “Theory and Simulation of Industrial Fluid Machines” in the Sustainable Industrial Engineering degree course.
- Lecturer of the course titled “Machines and Energy Systems” in the Mechanical Engineering degree course.

Education

11/2020 **National Scientific Habilitation (ASN)**

Scientific Habilitation for associate professor (GSD 09/IIND-06)

3/2018 **PhD cum Laude**, in “Industrial and Environmental Engineering”
Defended at the University of Modena and Reggio Emilia.

4/2014 **Master's Degree in Vehicle Engineering, score 110/110 cum Laude**
Degree attained at the University of Modena and Reggio Emilia.

12/2011 **Bachelor's Degree in Mechanical Engineering, score 109/110**
Degree attained at the University of Modena and Reggio Emilia.

Journal Articles

1. Torri F., Berni F., Giacalone M., Mantovani S., Defanti S., Colombini G., Bassoli E., Merulla A., Fontanesi S., A methodology to reduce the computational effort in 3D-CFD simulations of plate-fin heat exchangers, (2024) Applied Thermal Engineering, DOI: 10.1016/j.applthermaleng.2024.122843
2. Iacovano C., Berni F., Cicalese G., Nuzzo S., Fontanesi S., An integrated 2D/3D numerical methodology to predict the thermal field of electric motors, (2024) Case Studies in Thermal Engineering, 56, DOI: 10.1016/j.csite.2024.104233
3. Fontanesi S., Shamsudheen F.A., Gonzalez E.G., Sarathy S.M., Berni F., d'Adamo A., Borghi M., Breda S., Impact of fuel surrogate formulation on the prediction of knock statistics in a single cylinder GDI engine, (2024) International Journal of Engine Research, 25 (3), pp. 405 - 423, DOI: 10.1177/14680874231195742
4. Sfriso S., Berni F., Fontanesi S., d'Adamo A., Frigo S., Antonelli M., Borghi M., Proposal and validation of a numerical framework for 3D-CFD in-cylinder simulations of hydrogen spark-ignition internal combustion engines, (2024) International Journal of Hydrogen Energy, 53, pp. 114 - 130, DOI: 10.1016/j.ijhydene.2023.12.027
5. Berni F., Pessina V., Teodosio L., d'Adamo A., Borghi M., Fontanesi S., An integrated 0D/1D/3D numerical framework to predict performance, emissions, knock and heat transfer in ICEs fueled with NH3–H2 mixtures: The conversion of a marine Diesel engine as case study, (2024) International Journal of Hydrogen Energy, 50, pp. 908 - 938, DOI: 10.1016/j.ijhydene.2023.09.158
6. Berni F., Mortellaro F., Pessina V., Paltrinieri S., Pulvirenti F., Rossi V., Borghi M., Fontanesi S., Modeling of gaseous emissions and soot in 3D-CFD in-cylinder simulations of spark-ignition engines: A methodology to correlate numerical results and experimental data, (2023) International Journal of Engine Research, 24 (5), pp. 2149 - 2174, DOI: 10.1177/14680874221112564
7. Teodosio L., Berni F., Optimization via genetic algorithm of a variable-valve-actuation spark-ignition engine based on the integration between 1D/3D simulation codes and optimizer, (2023) International Journal of Engine Research, 24 (4), pp. 1760 - 1784, DOI: 10.1177/14680874221099874
8. V. Pessina, F. Berni, S. Fontanesi, A. Stagni, M. Mehl, Laminar flame speed correlations of ammonia/hydrogen mixtures at high pressure and temperature for combustion modeling applications, International Journal of Hydrogen Energy, Volume 47, Issue 61, 2022, Pages 25780-25794, https://doi.org/10.1016/j.ijhydene.2022.06.007.
9. F. Berni, S. Sparacino, M. Riccardi, A. Cavicchi, L. Postrioti, M. Borghi, S. Fontanesi, A zonal secondary break-up model for 3D-CFD simulations of GDI sprays, Fuel, Volume 309, 2022, https://doi.org/10.1016/j.fuel.2021.122064.
10. Berni F, Mortellaro F, Pessina V, et al. Modeling of gaseous emissions and soot in 3D-CFD in-cylinder simulations of spark-ignition engines: A methodology to correlate numerical results and experimental data. International Journal of Engine Research. 2022;0(0). doi:10.1177/14680874221112564
11. Teodosio L, Berni F. Optimization via genetic algorithm of a variable-valve-actuation spark-ignition engine based on the integration between 1D/3D simulation codes and optimizer. International Journal of Engine Research. 2022;0(0). doi:10.1177/14680874221099874
12. Fontanesi, S., Olcuire, M., Cicalese, G., Lamberti, L. et al., "Computational Fluid Dynamics (CFD) Analysis of Lubricant Oil Tank Sloshing of a High-Performance Car under Racetrack Maneuvers," *SAE Int. J. Engines* 15(2):185-201, 2022, https://doi.org/10.4271/03-15-01-0008.
13. 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), DOI: 10.1016/j.applthermaleng.2021.116838
14. Rulli, F., Fontanesi, S., d'Adamo, A., Berni, F. "A critical review of flow field analysis methods involving proper orthogonal decomposition and quadruple proper orthogonal decomposition for internal combustion engines", International Journal of Engine Research (2021), DOI: 10.1177/1468087419836178
15. 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), DOI: 10.1016/j.applthermaleng.2020.115320
16. Cavicchi, A., Postrioti, L., Berni, F., Fontanesi, S., Di Gioia, R. "Evaluation of hole-specific injection rate based on momentum flux measurement in GDI systems", Fuel (2020), DOI: 10.1016/j.fuel.2019.116657
17. 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", International Journal of Engine Research (2020), DOI: 10.1177/1468087419851905
18. 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", Fuel (2020), DOI: 10.1016/j.fuel.2019.116741
19. Mangeruga, V., Giacopini, M., Barbieri, S., Berni, F. et al., "Design of a Hybrid Power Unit for Formula SAE Application: Packaging Optimization and Thermomechanical Design of the Electric Motor Case", *SAE Int. J. Adv. & Curr. Prac. in Mobility* (2019), DOI: 10.4271/2019-24-0197.
20. Sparacino, S., Berni, F., D'Adamo, A., Krastev, V.K., Cavicchi, A., Postrioti, L. "Impact of the primary break-up strategy on the morphology of GDI sprays in 3D-CFD simulations of multi-hole injectors", Energies (2019), DOI:10.3390/en12152890
21. 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", Fuel (2019), DOI: 10.1016/j.fuel.2019.01.111
22. 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", Applied Energy (2019), DOI: 10.1016/j.apenergy.2019.04.093
23. 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" SAE International Journal of Engines (2018), DOI:10.4271/03-12-01-0007
24. Teodosio, L., Pirrello, D., Berni, F., De Bellis, V., Lanzafame, R., D'Adamo, A. "Impact of intake valve strategies on fuel consumption and knock tendency of a spark ignition engine", Applied Energy (2018), DOI: 10.1016/j.apenergy.2018.02.032
25. Berni, F., Cicalese, G., Fontanesi, S. "A modified thermal wall function for the estimation of gas-to-wall heat fluxes in CFD in-cylinder simulations of high performance spark-ignition engines", Applied Thermal Engineering (2017), DOI: 10.1016/j.applthermaleng.2017.01.055
26. Berni, F., Fontanesi, S., Cicalese, G., D'Adamo, A. "Critical aspects on the use of thermal wall functions in CFD in-cylinder simulations of spark-ignition engines" SAE International Journal of Commercial Vehicles (2017), DOI:10.4271/2017-01-0569
27. Shekhawat, Y., Haworth, D.C., D'Adamo, A., Berni, F., Fontanesi, S., Schiffmann, P., Reuss, D.L., Sick, V. "An Experimental and Simulation Study of Early Flame Development in a Homogeneous-charge Spark-Ignition Engine", Oil and Gas Science and Technology (2017), DOI: 10.2516/ogst/2017028
28. D'Adamo, A., Breda, S., Iaccarino, S., Berni, F., Fontanesi, S., Zardin, B., Borghi, M., Irimescu, A., Merola, S. "Development of a RANS-Based Knock Model to Infer the Knock Probability in a Research Spark-Ignition Engine", SAE International Journal of Engines (2017), DOI: 10.4271/2017-01-0551
29. Cicalese, G., Berni, F., Fontanesi, S. "Integrated in-cylinder / CHT methodology for the simulation of the engine thermal field: An application to high performance turbocharged DISI engines", SAE International Journal of Engines (2016), DOI: 10.4271/2016-01-0578
30. De Bellis, V., Bozza, F., Fontanesi, S., Severi, E., Berni, F. "Development of a phenomenological turbulence model through a hierarchical 1D/3D approach applied to a VVA turbocharged engine" SAE International Journal of Engines (2016), DOI: 10.4271/2016-01-0545

Modena, 09/07/2024