

Curriculum vitae di Davide Monsorno

ERC sector PE8: *Product and processes engineering*

PERSONAL DETAILS

Family name, First name: Monsorno, Davide

Birthdate: 13 May 1989

<https://www.linkedin.com/in/davidemonsorno/>

• Education and key qualifications

- 05/02/2018 **PhD (Doctorat en Sciences de l'Ingenieur – thermodynamics and fluid mechanics)**
[Multi-phase and reacting flows group](#) – [Thermodynamics and fluid mechanics division](#) –
[Institute of Mechanics, Materials and Civil Engineering](#) – [Université catholique de Louvain](#),
Belgium
Thesis: [Modelling and simulation of fluid-saturated granular materials with application to
sedimentation flows](#)
Supervisor: [prof. Miltiadis V. Papalexandris](#)
- 2014 **Second level diploma, Industrial engineering**, Sant'Anna School of Advanced Studies,
Italy
- 2013 **MSc in Aerospace engineering** (Aeronautical engineering - aerodynamics), Facoltà di
ingegneria Aerospaziale, Dipartimento di ingegneria civile e industriale, Università di Pisa,
Italy

• Current position(s)

- 2026 – today **Senior Manager Advanced Development Propulsion**
Röchling group, Automotive Division, Italy
Global product research responsibility (TRL 3-6) for Propulsion and Battery solutions
- 2023 – today **Coordinator MAC injection molding**
Materials and applications Center of excellence, Röchling Automotive

• Previous position(s)

- 2024 – 2025 **Manager Advanced Development Propulsion**
Röchling group, Automotive Division, Italy
- 2023 **Team Leader Advanced Development**
Röchling group, Automotive Division, Italy
- 2018 – 2022 **Project Leader Advanced Development**
Röchling group, Automotive Division, Italy
- 2018 **Thermo-fluid Dynamics Expert**
Röchling group, Automotive Division, Italy
- 2017 **Research assistant**
Université catholique de Louvain, Belgium
- 2014 – 2016 **Marie-Curie ESR fellow**
EC FP7 project SEDITRANS, Université catholique de Louvain, Belgium

2013	R&D intern Future systems laboratory, MBDA, Italy
2011	Visiting researcher California Institute of Technology, US
2010	Visiting researcher NASA Jet Propulsion Laboratory, US

RESEARCH ACHIEVEMENTS AND PEER RECOGNITION

Research achievements

Davide Monsorno's main technology and scientific contributions are in the fields of polymer applications for thermal transfer and flow control, and in the thermodynamic description of multi-phase systems such as granular suspensions and flows with thermally-induced phase change. They can be currently clustered in two main areas:

- from an industrial research perspective, he has led the introduction of pioneering plastic and plastic-metal hybrid concepts targeted at metal replacement for EV applications, aimed at attacking the standing cost- and environmental impact issues of electric mobility.
- from a scientific perspective, he has developed a new thermomechanical theory for granular suspensions, which exploits thermodynamic constraints to close a two-phase Eulerian description of suspensions of a hard materials (e.g. sand, chemical/pharmaceutical compounds) in a liquid medium. Further, he has developed the necessary algorithms (based on a generalization of the classic Chorin-Temam projection method) to solve numerically two-phase flows of dilatant suspensions. These methods were demonstrated at full scalability in purpose-built parallel solvers for stratified flows of scientific interest such as the first two-phase Eulerian description of compacting suspensions, particle migration effect in narrow channels, and interface-dominated flows e.g. submerged-column collapse.

Technology contributions

The main areas of activity of Davide Monsorno's department are battery cooling, structural lightweight, thawing systems for aqueous solutions, electrical sensing and fluid control (coupled thermodynamics, fluid mechanics and magnetostatics). Current contributions, by research direction, include:

- Thermal management: development and serial industrialization of new rotary coolant valve concepts
- Prismatic battery cooling: thin-film polymer coolers with integrated swelling compensation for aluminum substitution in prismatic cell packs
- Cylindrical battery cooling: structural polymer coolers for aluminum substitution in cylindrical cell packs
- Cylindrical battery holders: PU thermoset foam replacement structure for improved maintainability and recyclability at lower weight
- High-performance thawing exchangers: large surface conductive-PP fluid-solid exchangers for water-injection tanks
- Plastic-hybrid heat exchangers: chemical and physical leak-tight bonding of metal and plastic fluid control components for electronics cooling

While some details of the above activities are currently customer-confidential, the following patents and applications are supplied as reference (only public patent documents where D. Monsorno is explicitly an author, other patents from his group are not listed).

- EP4528205A1 Hybrid plastic-metal heat exchangers. This technology allows a weight reduction up to 40% and a cost reduction up to 20% with respect to current die-cast components for DC-DC actively-cooled enclosures
- EP4525138A1 Plastic cell coolers/warmers and cell holders. This technology allows to reduce cost up to 30% with respect to brazed aluminum extrusions in current

- US11346269B2 generation pack designs, with a significant integration potential for next-generation designs
- US2022228899A1 Tank-heater elements for integrated hydraulic-electric thawing. This technology enables high-performance thawing (above 5 kW), which is necessary for water-injection applications, at sustainable cost
- US12203555B2 Polymer fluid sensors for continuous level measurement. This technology enables very-low-cost continuous washer-fluid level measurement, which is a necessity to make centralized cleaning systems for autonomous driving economically viable
- US2023151896A1 Injection-molded plastic conical flow valves for EV thermal management. This technology reduces cost by 30% with respect to standard rotating valve designs and eliminates the need for highly-specialized, PFAS-containing elastomer interfaces
- US2023151896A1 Manifold-valve integration interface This technology permits simple integration of precision injection-molded flow valves inside thin-shell PP cooling manifolds with standard production tolerances

Other published contributions related to coolant valve design and optimization were generated in the course of an industrial PhD supervision and are listed below.

1. Grotti, E., Monsorno, D. and Renzi, M., (2024), “Thermal management improvement in electric vehicles through design optimization of coolant distributor valves, Next Energy, Vol 3, 100099, <https://doi.org/10.1016/j.nxener.2024.100099>
2. Grotti, E., Monsorno, D. and Renzi, M., (2022), “Realistic Operating Conditions from Vehicle Modeling: An Application to Coolant Distributor Valves”, SAE Technical Paper 2022-24-0017, <https://doi.org/10.4271/2022-24-0017>

Scientific contributions

The following publications, pertaining to the description of granular suspensions, comprise the main scientific results. References 3 to 6 detail the development of a general continuum description for two-phase liquid solid mixtures, the specialization of such description to low-Mach number flows and the rigorous derivation of an incompressible limit for granular suspensions. Further, they illustrate numerical algorithms for the solution of the resulting flow equations for dilatant flows and their implementation in numerical models which are applied to problems of scientific interest.

3. Monsorno, D., Dimas, A.A. and Papalexandris, M.V., (2018), “Time-accurate calculation of two-phase granular flows exhibiting compaction, dilatancy and nonlinear rheology”, Journal of Computational Physics, Vol. 372, p.799-822, <https://doi.org/10.1016/j.jcp.2018.06.061>
4. Monsorno, D., Varsakelis, C. and Papalexandris, M.V., (2017), “Poiseuille flow of dense non-colloidal suspensions: the role of intergranular and nonlocal stresses in particle migration”, Journal of Non-Newtonian Fluid Mechanics, Vol. 247, p.229-238, <https://doi.org/10.1016/j.jnnfm.2017.08.002>
5. Monsorno, D., Varsakelis, C. and Papalexandris, M.V., (2016), “A two-phase thermomechanical theory for granular suspensions”, Journal of Fluid Mechanics, Vol. 808, p.410-440, <https://doi.org/10.1017/jfm.2016.649>
6. Varsakelis, C., Monsorno, D. and Papalexandris, M.V., (2015), “Projection methods for two velocity–two pressure models for flows of heterogeneous mixtures”, Computers & Mathematics with Applications, Vol. 70, Issue 5, p.1024-1045, <https://doi.org/10.1016/j.camwa.2015.06.023>

The following invited papers and talks also regard granular suspensions:

7. Varsakelis, C., Monsorno, D. and Papalexandris, M.V., (2014), “Two-phase flow modelling for sediment transport: application to gravity-driven flows of subaqueous granular beds”, ERCOFTAC bulletin, Vol. 100, p.14-18, [two-phase_flow_modelling_for_sediment_transport](https://doi.org/10.1016/j.ercftac.2014.03.002)
8. Varsakelis, C., Monsorno, D. and Papalexandris, M.V., “Two-Phase Flow Modelling of Sediment Transport: Challenges and Potential Applications”, CSME-14/SARCLE-14: Adapting Sustainable Remediation and Management of Soil, Sediment and Water, (Belgium, 20-22/10/2014), <http://hdl.handle.net/2078.1/152953>

As part of his membership in the American Physical Society, Davide Monsorno presented the following advancements during APS DFD meetings:

- Monsorno, D., Varsakelis, C. and Papalexandris, M.V., “Particle migration in granular suspensions: a numerical study of sedimentation processes”, APS 70th Annual Meeting of the Division of Fluid Dynamics (Denver, 19-21/11/2017), <http://hdl.handle.net/2078.1/187681>
- Monsorno, D., Varsakelis, C. and Papalexandris, M.V., “A nonlinear description of the viscosity and dilatancy of granular suspensions”, APS 69th Annual Meeting of the Division of Fluid Dynamics (Portland, 20-22/11/2016), <http://hdl.handle.net/2078.1/177680>
- Monsorno, D., Varsakelis, C. and Papalexandris, M.V., “A continuum theory for two-phase flows of particulate solids: application to Poiseuille flows”, APS 68th Annual Meeting of the Division of Fluid Dynamics (Boston, 23-27/11/2015), <http://hdl.handle.net/2078.1/167847>
- Monsorno, D., Varsakelis, C. and Papalexandris, M.V., “Numerical study of axisymmetric collapses of submarine granular columns”, APS 67th Annual Meeting of the Division of Fluid Dynamics (San Francisco, 23-25/11/2014), <http://hdl.handle.net/2078.1/176415>

Awards and peer recognition

Davide Monsorno has been awarded the following personal grants and funding fellowships:

- Chargé de Recherches, F.R.S.-FNRS, GranTurb project, 3 years (awarded, not utilized due to switch towards industry)
- Special Research Funds, UCLouvain, 1 year
- Marie-Curie ESR, European Commission, FP7 SEDITRANS project, 3 years
- Allievo ordinario di Secondo Livello, Sant’Anna School of Advanced Studies, full tuition, 2 years
- Allievo ordinario di Primo Livello, Sant’Anna School of Advanced Studies, full tuition, 3 years

Further, as part of his industrial research activity he has obtained public funding for the following industrial projects:

- “High durability flow-control and heat-exchange polymer solutions for thermal management components”, project cost 248 k€
- “Involucro di nuova generazione in plastica per componenti elettronici di potenza”, project cost 264 k€
- “Bocchettoni di ricarica integrati”, project cost 112 k€
- “Sistema di trattenimento strutturale per celle a raffreddamento integrato”, project cost 248 k€
- “Riscaldatori elettrici per BEV”, project cost 248 k€
- “Applicazione della plastica nei motori elettrici”, project cost 257 k€
- “Cell-holder integrati per pacchi batteria a celle prismatiche”, project cost 234 k€

The technical solutions developed by his team have won the Global Innovation Award of the Röchling Group. The cooperations he set up with Formula SAE teams at the University of Trento and at the University of Padova have been featured in international automotive conferences and have resulted in significant business opportunities in previously-unexplored sectors. He is an alumnus of Röchling’s Core Talent program.