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Engineering & Scientific Consulting

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Professional Profile

Dr. Francesco Colella is a Managing Engineer in Exponent's Thermal Sciences practice. He specializes in mechanical engineering and in the areas of fluid-mechanics, heat transfer, thermodynamics, fire dynamics and combustion. Application areas include fire and explosion origin & cause investigations, failure analysis of industrial equipment and consumer products, battery systems, heat transfer systems, fuel distributions and storage systems.

Dr. Colella has broad experience investigating and solving complex multidisciplinary problems in a large variety of applications including fires and explosions in underground structures, parking garages, ships and residential structures, wildland fires, battery thermal management, consumer products, atmospheric flows and a wide range of energy systems. He has extensive experience evaluating the consequences and risks associated with the release of toxic and flammable substances, fires and explosions in Oil and Gas facilities including LNG terminals, peak shaving plants and other industrial facilities. In this context, he routinely evaluates such facilities with current and historical regulations, codes, and guidelines.

Dr. Colella has worked extensively in the analysis of condensation phenomena in a multitude of applications including industrial equipment (i.e. storage systems, pressure vessels, photovoltaic systems) as well as in the context of slip-and-fall accidents. He has extensive experience in the analysis and investigation of burn injuries in the context of industrial and residential accidents and he also works proactively with industry to characterize the burn risk associated with wearable devices and various consumer products.

Dr. Colella is currently principal member of the NFPA 502 committee (Standard for Road Tunnels, Bridges, and other Limited Access Highways) and also a member of NFPA 1700 committee (Guide for Structural Fire Fighting).

Prior to joining Exponent, Dr. Colella was a postdoctoral research assistant in the Energy Department at the Politecnico di Torino (Italy), and research assistant at the BRE Centre for fire safety engineering at the University of Edinburgh (UK). For his doctoral thesis, he developed a multiscale 1D-3D CFD technique to reduce the computational time for tunnel fire safety applications. During his career, he carried out several CFD analyses of ventilation systems for various major tunnels in Europe. In addition, Dr. Colella worked on the development of numerical models to analyze the ignition behavior of porous fuel beds for wildland fire applications and to characterize the heating behavior of passive fire protection materials subject to jet fire and rapid-rise fire tests.

Academic Credentials & Professional Honors

Ph.D., Energetics, Politecnico di Torino, Italy, 2010

M.Eng., Mechanical Engineering, Politecnico di Torino, Italy, with honors, 2005

Committee on Operational Safety of Underground Facilities (ITA-COSUF) 2014 Award

Best Paper Award, International Symposium on Tunnel Safety and Security, 2014

Licenses and Certifications

Licensed Professional Mechanical Engineer, California, #38704

Certified Fire and Explosion Investigator (CFEI) in accordance with the National Association of Fire Investigators National Certification Board per NFPA 921 Section 13.6.5.2

Registered Professional Industrial Engineer, Italy, Turin Section, 10787X

Professional Affiliations

Principal member of NFPA 502 - Standard for Road Tunnels, Bridges, and other

Alternate member of NFPA 1700 - Guide for Structural Fire Fighting

Limited Access Highways

Editorial board member of the NFPA journal Fire Technology

The International Association for Fire Safety Science — IAFSS

National Fire Protection Association (NFPA)

National Association of Fire Investigators (NAFI)

Languages

Italian

Spanish

Publications

Book Chapters

Ponchaut F, Colella F, Marr K. Vapor Clouds. Chapter in "SFPE Handbook of Fire Protection Engineering," 5th Edition, Springer, 2015.

Colella F, Rein G, Borchiellini R, Verda V. One dimensional and multi-scale modelling of tunnel ventilation and fires. Chapter in: The Handbook of Tunnel Fire Safety. Second Edition, Thomas Telford, Ltd, 2012.

Journal Publications

Vaitkevicius A, Colella F, Carvel R. Investigating the Throttling Effect in tunnel fires. Fire Safety Journal, 2015.

Carvel R, Colella F, Rein G. Designing safety systems for tunnel fire events. Engineering and

Computational Mechanics 2012. doi:/10.1680/eacm.11.00015.

Simeoni A, Thomas JC, Bartoli P, Borowieck P, Reszka P, Colella F, Santoni PA, Torero JL. Flammability studies for wildland fires using the fire propagation apparatus, Fire Safety Journal 2012, in press.

Sciacovelli A, Colella F, Verda V. Melting of PCM in a thermal energy storage unit: Numerical investigation and effect of nano-particles enhancement. International Journal of Energy Research 2012, in press.

Carvel R, Colella F, Rein G. Using active systems to control tunnel fire events. Engineering and Computational Mechanics, 2012. doi:/10.1680/eacm.11.00015.

Colella F, Sciacovelli A, Verda V. Numerical analysis of a medium scale latent energy storage unit for district heating systems. Energy 2012; 45(1):397-406. doi:/10.1016/j.energy.2012.03.043.

Colella F, Rein G, Borchiellini R, Verda V. Multiscale modelling of the transient flows from fire and ventilation in long tunnels. Computers & Fluids 2011; 51(1):16-29. doi:10.1016/j.compfluid.2011.06.021

Verda V, Colella F Primary energy savings through thermal storage in district heating networks. Energy 2011; 36(7):4278-4286. doi:10.1016/j.energy.2011.04.015.

Colella F, Rein G, Borchiellini R, Torero JL. A novel multiscale methodology for simulating tunnel ventilation flows during fires. Fire Technology 2011; 47(1):221-253. doi:10.1007/s10694-010-0144-2.

Colella F, Rein G, Reszka P, Carvel R, JL Torero. Analysis of the ventilation systems in the Dartford tunnels using a multiscale modelling approach. Tunneling and Underground Space Technology 2010; 25:423-432. doi:10.1016/j.tust.2010.02.007.

Colella F, Rein G, Borchiellini R, Carvel R, Torero JL, Verda V. Calculation and design of tunnel ventilation systems using a two-scale modelling approach. Building and Environment 2009; 44:2357-2367. doi:10.1016/j.buildenv.2009.03.020.

Colella F, Uche J, Dejo N. Desalted water provided by a polygeneration scheme for the tourist sector. Desalination 2007; 205:279-297.

Conference Publications and Presentations

Vytiniotis, A., Colella, F., Budiansky, N., Kytomaa H., Lessons Learned – Investigating failures of LNG containment systems, Gastech 2019, September 17-19, 2019, Houston, Texas.

Colella, F., Hart, R., Ibarreta, A., Watson, H., Yen, M., Jet Fire Consequence Analysis, Gastech 2019, September 17-19, 2019, Houston, Texas.

Kytomaa, H., Colella F., Understanding and Investigating Burn Injuries, University of Washington Seminar, December 2018.

Kytomaa, H., Colella F., Understanding and Investigating Burn Injuries, Worcester Polytechnic Institute (WPI) Seminar, November 2018.

Kytomaa, H., Barry, M., Colella, F., Narajan, S., Lee, K., Morse, T., Investigating Burn Injuries, AEGIS 2018 Claims Seminar, October 2018.

Kytomaa, H., Barry, M., Colella, F., Narajan, S., Lee, K., Morse, T., Investigating Burn Injuries, DRI - Fire Science and Litigation: Burning down the House, September 2018.

Colella, F., Ibarreta, A., Hazard and Consequence Analysis of Flammable Releases, New England Chapter of the Society of Fire Protection Engineers (SFPE), November 5, 2018.

Colella, F., Ibarreta, A., Modeling of Flammable Releases in Industrial Facilities, NFPA Conference and Expo, June 11-14, 2018, Las Vegas, USA

Ibarreta, A., Colella, F., Wolf, M., O'Hern S., Myers, T., Modeling of Explosion Venting Fireballs, 12th International Symposium on Hazards, Prevention and Mitigation of Industrial Explosions Kansas City, USA - August 12-17, 2018

Ibarreta, A., Colella, F., Wolf, M., Vickery, J., O'Hern S., Myers, T., Measuring Leak Flow Rates in Fire and Explosion Investigations, International Symposium on Fire Investigation Science and Technology, September 24-26, 2018.

Wolf, M., Colella, F., Morse, T., Barry M., Space Heater Fires and Fire Investigation, International Symposium on Fire Investigation Science and Technology, September 24-26, 2018.

Colella, F., Tunnel Fire Safety, NFPA Conference and Expo, June 4-7, 2017, Boston, USA

Colella, F., On the Use of CFD for the Design and Permitting of LNG Facilities, Energy and Process CFD Symposium, Houston, 2017

Colella, F., Understanding Electric Vehicle Fires, 8th Annual Fire Protection and Safety in Tunnels, 2016, 06-08 September 2016, Stavanger, Norway.

Colella F, Ponchaut N, Biteau H, Marr K, Somandepalli V, Horn QC, Long RT. Electric vehicle fires. 7th International Symposium on Tunnel Safety and Security, Montreal, Canada, March 16-18, 2016.

Colella F, Ponchaut N, Biteau H, Marr K, Somandepalli V, Horn QC, Long RT. Characterization of electrical vehicle fires. 16th International Symposium on Aerodynamics, Ventilation and Fire in Tunnels, Seattle, WA, September 15-17, 2015.

Colella F, Rosen, J., Ponchaut N. Smoke confinement velocity and back-layering distance in tunnel fires. 16th International Symposium on Aerodynamics, Ventilation and Fire in Tunnels, Seattle, WA, September 15-17, 2015.

Ponchaut N, Colella F, Marr K, Somandepalli V, Horn Q. Thermal runaway and safety of large lithium-ion battery systems. International Stationary Battery Conference, Orlando, FL, May 12-14, 2015.

Colella F. Modeling fire emergencies in underground systems. 3rd Annual Tunnels Fire Safety Forum, Amsterdam, Netherlands, April 15-16, 2015.

Ponchaut N, Colella F, Ibarreta A, Kytomaa, H. Effectiveness of vapor fences in mitigating LNG jetting & flashing releases. 10th Global Congress on Process Safety, New Orleans, LA, March 30-April 2, 2014.

Ponchaut N, Colella F, Stern M, Somandepalli V. Thermal management modeling for thermal runaway avoidance in lithium-ion batteries. International Stationary Battery Conference, Boca Raton, FL, May 5-7, 2014.

Ponchaut NF, Colella F, Spray R, Horn Q. Thermal management modeling for avoidance of thermal runaway conditions in lithium-ion batteries. SAE 2014 World Congress, Detroit, MI, April 8-10, 2014.

Vermesi I, Colella F, Rein G, Jomaas G. The feasibility of multiscale modeling of tunnel fires using FDS 6. Poster Presentation for 6th International Symposium on Tunnel Safety and Security will be held in Marseille, France, March 12-14, 2014.

Vaitkevicius A, Colella F, Carvel R. Rediscovering the throttling effect. To be presented at the 6th International Symposium on Tunnel Safety and Security will be held in Marseille, France, 12-14 March, 2014. Winner of the ISTSS 2014 Best Paper Award.

Colella F, Ibarreta A, Ponchaut NF, Kytömaa F. Numerical Analysis of dense gas dispersion: Effect of staggered fences. Proceedings of the 16th Annual Mary Kay O'Connor Process Safety Center International Symposium, October 22--24, 2013.

Colella F, Marr K, Ponchaut NF, Somandepalli S, Spray R. Analysis of combustion hazards due to catastrophic failures in lithium-ion battery packs. Proceedings of the 7th International Seminar on Fire and Explosion Hazards, Providence, RI, May 5-10, 2013.

Colella F, Sciacovelli A, Verda V, Rein G. Multiscale modelling of fire scenarios in transverse ventilated tunnels. Proceedings of the 7th International Seminar on Fire and Explosion Hazards, Providence, RI, May 5-10, 2013.

Borchiellini R, Colella F, Capaci M, D'Angella P, Filippo E, Fronterré M, Verda V, Villa S. Multi-scale technique applied to the ventilation design for subway systems. International Congress "Fire Computer Modeling," Santander, Spain, October 18-19, 2012.

Thomas JC, Simeoni A, Colella F, et al. Piloted ignition regimes of wildland fuel beds. Poster presentation, EGU General Assembly, 2012.

Sciacovelli A, Verda V, Colella F Numerical models for storage systems based on phase change materials. Proceedings, IMECE2011ASME International Mechanical Engineering Congress & Exposition, Denver, CO, November 11-17, 2011.

Thomas JC, Simeoni A, Colella F, Torero JL. Piloted ignition regimes of wildland fuel beds. Poster Presentation, 10th International Symposium on Fire Safety Science, College Park, MD, June 19-24, 2011. Also at NFPA 2011 Conference and Expo, Boston, MA, June 13, 2011.

Colella F, Sciacovelli A, Bal N, Verda V. Comparison of CFD predictions to experimental measurements from medium-scale pool fires under natural and forced ventilation. Poster Presentation, 10th International Symposium on Fire Safety Science, College Park, MD, June 19-24, 2011.

Colella F, Rein G, Verda V, Borchiellini R, Torero JL. A novel multiscale methodology for simulating tunnel ventilation flows during fires. Poster Presentation, 10th International Symposium on Fire Safety Science, College Park, MD, June 19-24, 2011.

Colella F, Sciacovelli A, Verda V. Numerical analysis of a medium scale latent energy storage unit for district heating systems. The 24th International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems, Novi Sad, Serbia, July 4-7, 2011.

Colella F, Rein G, Verda V, Borchiellini R, Torero JL. Time-dependent multiscale simulations of fire emergency in longitudinally ventilated tunnels. 10th International Symposium on Fire Safety Science, College Park, MD, June 19-24, 2011.

Verda V, Sciacovelli A, Colella F Network model for the analysis and diagnosis of large SOFC STACKS. Proceedings, 2011 Energy Sustainability Conference and Fuel Cell Conference, Washington, D.C., August 7-10, 2011.

Colella F A novel multiscale methodology for simulating tunnel ventilation flows during fires. Lloyds Science of Risk Prize Award Conference, London, England, October 24, 2010.

Colella F Multiscale analysis of tunnel ventilation flows and fires. 2nd Annual Conference in Fire Protection and Safety in Tunnels, Milano, Italy, October 25-27, 2010.

Colella F, Verda V, Borchiellini, R. Multiscale modelling of tunnel ventilation flows and fires. World Road Association, Italian Meeting, Rome, Italy, October 13-16, 2010.

Simeoni A, Colella F, Bartoli P, Torero JL. A study of forest fuel bed ignition. Mathematical and Physical Modeling of the Dangerous Natural Phenomena And Technogenic Accidents, Tomsk, Russian Federation, October, 18-20, 2010.

Colella F, Rein G, Verda V, Borchiellini R, Torero JL. Multiscale analysis of tunnel ventilation flows and fires. 11èmes journées du GDR Incendie, CSTB - Champs sur Marne, Paris, France, June 17-18, 2010.

Simeoni A, Colella F, Martinot E, Bartoli P, Torero JL. Flaming ignition of pine needle beds. VI International Conference on Forest Fire Research, Coimbra, Portugal, November 15-18, 2010.

Verda V, Colella F Thermal storage systems for district heating networks. ASME 2010, 4th International Conference on Energy Sustainability, Phoenix, AZ, May 17-22, 2010.

Colella F, Borchiellini R, Carvel R, Rein G, Steinhaus T, Torero JL, Verda V. Design of tunnel ventilations systems for fire emergencies using multiscale modeling. 4th International Symposium on Tunnel Safety and Security, Germany, March 17-19, 2010.

Colella F, Sciacovelli A, Verda V, Borchiellini R, Rein G, Carvel R. Multiscale modelling of fire emergencies in a transverse ventilated tunnel. Proceedings, 5th International Symposium on Tunnel Safety and Security, New York, NY, March 14-16, 2010.

Colella F, Rein G, Carvel R, Torero JL. Tunnel ventilation effectiveness in fire scenarios. FS-World Magazine, Spring 2010, Special Edition on Tunnel Safety, pp. 36-40.

Simeoni A, Reszka, P, Colella F, Torero JL. Flaming ignition of wildland fuels. 6th International Seminar on Fire and Explosion Hazards, Leeds, 2010.

Cavallo A, Crosfield R, Colella F, Carvel R, Rein G, Torero JL. travelling distance of droplets from water mist suppression systems in tunnels with longitudinal ventilation. Advanced Research Workshop: Fire Protection and Life Safety in Buildings and Transportation Systems, Santander, 2009.

Cavallo A, Crosfield R, Colella F, Carvel R, Rein G, Torero JL. Approximate travelling distances of water mist droplets in tunnels. International Water Mist Conference, London, England, September 23-20, 2009.

Colella F, Neale P, Rein G, Schafer AI, Torero JL. Real world science based criteria for sustainable fire retarded materials. Green Light Fire Safety Summit, 20th National Association of State Fire Marshalls Annual General Meeting, Seattle, WA, June 18, 2009.

Colella F, Borchiellini R, Rein G, Verda V. Modelling complex tunnel ventilation systems and fires using multi-scale techniques. 2nd International Safety Forum for Road and Rail, Lyon, France, April 2009.

Colella F, Rein G, Carvel R, Reszka P, Steinhaus T, Torero JL. Analysis of the ventilation systems in the Dartford Tunnels using multi-scale modelling approach. 2nd International Safety Forum for Road and Rail, Lyon, France, April 2009.

Colella F, Borchiellini R, Carvel R, Rein G, Torero JL, Verda V. Two-scale modelling approach for simulating flows in tunnel fires. International congress in smoke control buildings and tunnels, Santander, Spain, October 2008.

Colella F, Borchiellini R, Carvel R, Rein G, Torero JL, Verda V. Two-scale modelling approach for simulating flows in tunnel fires. Poster Presentation, 9th Symposium on Fire Safety Science, Karlsruhe, Germany, September 21-26, 2008.

Colella F, Borchiellini R, Carvel R, Rein G, Reszka P, Verda V. Two-scale modelling approach to tunnel ventilation flows. 21st Scottish Fluid Mechanics Meeting, Edinburgh, Scotland, May 22, 2008.

Colella F, Uche J. Desalted water provided by a polygeneration scheme for the tourist sector. Euromed 2006 Conference, Montpellier, France, May 2006.

Webinars

Kytomaa, H., Barry, M., Colella, F., Narajan, S., Lee, K., Morse, T., Caution Hot, Understanding and investigating Burn Injuries, September 2017.

Peer Reviewer

Fire Safety Journal

Fire Technology

Computers and Fluids

Heat Transfer Research

International Journal of Thermodynamics