Resume

Chris Atkinson, Sc.D. (*Christopher M. Atkinson*)
Fellow ASME (American Society of Mechanical Engineers)
Fellow SAE (Society of Automotive Engineers).

EXPERTISE

Advanced mobility, smart mobility, transportation and vehicle technologies. Engines; exhaust emissions reduction; fuel efficiency improvement and GHG reduction; alternative fuel and NG utilization; hybrid electric vehicle development. High-efficiency HVAC technologies. Technology assessment, technical due diligence, innovation, research and development, entrepreneurship and commercialization in advanced clean and sustainable energy technologies. Development and deployment of low GHG energy technologies. Advanced energy systems. Fluid mechanics, heat and mass transfer. Multiphase flows, flows in porous media, highly concentrated slurries and suspensions.

I. PROFESSIONAL BACKGROUND

2022-present	On Assignment: Deputy Director of Advanced Research, US Department of Transportation, Office of the Assistant Secretary for Research and Technology.
2020-present	Professor of Mechanical and Aerospace Engineering, Ohio State University. Director, Smart Mobility Initiative.
2014-2020	Program Director, Advanced Research Projects Agency – Energy (ARPA-E), US Department of Energy. Developing programs to fund high risk, high reward innovative energy technologies for generation, storage, distribution and usage.
2000-present	Founder, Atkinson LLC. Developer of innovative commercial methods for model-predictive control and calibration for engines and industrial processes.
2009-2011	Full Professor (with tenure), Department of Mechanical and Aerospace

	Engineering, West Virginia University. Director of the Center for Alternative Fuels, Engines and Emissions.
2002-2008	Member, International Scientific Advisory Board, Combustion Engine Research Center, Chalmers University, Gothenburg, Sweden.
2000-2002	Chief Engineer and Co-Founder, Calico Systems Inc.
1996-2000	Associate Professor (with tenure), Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV.
1991-1995	Assistant Professor, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV.

II. EDUCATION

1991	Sc.D. (Doctor of Science in Mechanical Engineering in the Thermal Sciences), Massachusetts Institute of Technology. Dissertation: Acoustic Wave Propagation in Highly Concentrated Slurries and Suspensions.
1987	MS (Mechanical Engineering), West Virginia University.
1983	BS (Chemical Engineering), University of Natal, South Africa.

III. PROFESSIONAL ACHIEVEMENTS

Research and Development Program Management – Federal

Program Director, Advanced Research Projects Agency – Energy (ARPA-E), US Department of Energy. Program management of high risk, high reward innovative energy technologies for generation, storage, distribution and usage. Responsible for project commercialization, including demonstration projects and pilot deployments. Responsible for over $120 million in project funding and oversight (2014-2020) including thermal science-based energy systems. Conception and development of NEXTCAR, a $55 million program in improving the energy efficiency of connected and automated vehicles. Responsible for several engine development projects, including ARPA-E's largest single project (opposed piston, gasoline compression

Westport Fuel Systems Canada Inc.
EX 2004
Mercedes-Benz USA, LLC v. Westport Fuel Systems Canada Inc.
IPR2023-00351
Page 2 of 16

ignition engine). Other projects funded include high-efficiency HVAC, passive cooling techniques, marine hydrokinetic energy and solar PV components.

Expert Assessment and Litigation

Performed expert assessment for IP-related litigation concerning exhaust aftertreatment on behalf of Howard Rice Nemerovski Canady Falk & Rabkin (2005-2006).

Performed expert assessment for class action litigation concerning diesel passenger car exhaust aftertreatment and emissions on behalf of legal counsel (2016).

Performed expert assessment for class action litigation concerning excessive diesel engine exhaust emissions on behalf of legal counsel (2017).

Entrepreneurship and Business Development

Founded and developed two high technology companies (Calico Systems Inc. and Atkinson LLC) with over $7.5M in total billing since 2000 from over 15 clients in engines, fuels, emissions reduction and energy, including multinational corporations and government agencies. Responsible for business development, proposal preparation and negotiation, contracting, business methods implementation and management, financial and business strategy functions.

Achieved Defense Contracts Audit Agency (DCAA) financial controls and audit system compliance for Atkinson LLC (2005), required for participation in federally-funded contracting.

Software Development, Commercialization and Technology Transfer

Developed and commercialized a rapid transient engine calibration system using data-driven computational techniques, allowing for off-line model-based engine calibration, a transformative technology in the engine control and calibration field. Launch customer for conventional diesel fuels and GTL fuels was Sasol Inc. (2013-2014).

Developed a data-driven model-based engine calibration process for Cummins Inc. for their flagship heavy-duty diesel engine (2012-2013) to reduce engine development time, costs and effort.

Developed an innovative neural network model-based virtual sensing development system for Caterpillar Inc. to reduce the diagnostics burden for advanced heavy-duty engines (2010-2012).

Developed and implemented a world-first model-based control system for diesel engines for Detroit Diesel Corporation (Daimler Trucks NA), for the US DOE-funded Super Truck program to improve fuel efficiency, reduce exhaust emissions and improve engine performance. This data-driven model-based control system represents a significant improvement over conventional

Westport Fuel Systems Canada Inc.
EX 2004
Mercedes-Benz USA, LLC v. Westport Fuel Systems Canada Inc.
IPR2023-00351
Page 3 of 16

control systems, reducing costs and complexity while improving all measureable engine performance outcomes, including over 50% peak engine brake thermal efficiency (2010-2014).

Developed a data-driven model-based calibration methodology for Volvo AB (Sweden) for their heavy-duty diesel truck range (2006-2008).

Developed and prototyped advanced engine control and calibration methods for next generation high efficiency, low emissions HCCI engines for Caterpillar Inc. incorporating variable compression ratio (2005-2006).

Performed engine calibration system development for International Truck and Engine Corporation (Navistar) (1999-2005).

Developed a model-based calibration optimization system for Detroit Diesel Corporation (Daimler GmbH). Developed a rapid transient calibration system to calibrate heavy duty diesel engines to US EPA 2007 and 2010 exhaust emissions levels with a 75% reduction in the time to calibrate. Resulted in significant cost and time savings for the certification of new low emissions, high fuel efficiency engines (2005-2010).

Performed advanced engine calibration for Mack Trucks, reducing time and effort required to calibrate, and reducing corporate engine development costs (2000-2002).

Advanced Engine Technology Assessment

Performed technology assessment for potential diesel engines for BAE Inc. for the US Army Future Combat Systems (FCS) prototype unmanned ground vehicle MULE (2004).

Technology assessment for Argonne National Laboratory in advanced technology vehicle research (including diesels, hybrids and electric vehicles) (2002-2004).

Technology assessment for Halliburton for the design of next-generation engine-driven hydraulic fracturing pump systems (2005).

Alternative Fuels Development

Assisted PetroSA (South Africa) with its application to the US Department of Energy for gas-to-liquids (GTL) fuel to be designated as an alternative fuel under EPACT legislation (2000-2004).

Vehicle Fuel Efficiency Expert Assessment

Consulting Expert for USTDA-China Heavy Duty Commercial Vehicle Fuel Standards Study Tour (2013). Sponsored by the US Trade and Development Agency and managed by Tera International Group, Inc.

Westport Fuel Systems Canada Inc.
EX 2004
Mercedes-Benz USA, LLC v. Westport Fuel Systems Canada Inc.
IPR2023-00351
Page 4 of 16

Diesel Engine Product Development, Project Management and Technology Transfer

Developed a small diesel engine propulsion system for Lockheed Martin's tactical unmanned ground vehicle (TUGV) for Marine Corps based on the Mercedes-Benz OM660 engine. This vehicle was successfully tested at the US Marine Corps Base at Quantico, VA (2002-2004).

Developed an innovative diesel engine drive system for a hybrid electric unmanned ground combat vehicle (UGCV) [capable of running inverted] for Lockheed Martin and MillenWorks. This vehicle was successfully tested at the US Army's Yuma Proving Grounds, AZ (2000-2002).

Mechatronic Sensor Development and Technology Transfer

Developed a production-ready artificial intelligence-based knock-sensing system for spark-ignition engines for DENSO R&D (Japan) to improve the fuel efficiency of gasoline vehicles (2000-2002).

Developed a mechatronic refrigerant flow sensor to reduce the energy consumption of automotive air conditioning systems for Ford Motor Company (1991-1993).

Developed an innovative mechatronic multiphase flow sensor for measuring gas and liquid flowrates in producing oil and gas wells for Halliburton Energy Services (1996-2000).

Hybrid Electric Vehicle Development

Designed, developed and tested four hybrid electric vehicles while at West Virginia University (1991-2000) that achieved world-class fuel economy, while retaining acceptable performance and utility. Won the US DOE-sponsored FutureTruck Advanced Vehicle Competition in 2000.

Designed an innovative torque and speed control transmission for hybrid electric vehicles for Nissan R&D (Japan) to evaluate its efficacy as a candidate for next-generation vehicle powertrains (1995-1997).

Designed and developed two prototype linear, free-piston engines for electrical power generation for the Department of Defense (1996-2000), one <1 kW spark-ignited (SI) and the other a 5-kW compression ignition (CI).

Emissions Reduction Development

Developed an innovative engine exhaust emissions reduction system for NOx reduction (Transmural Catalysis) with N.N. Clark. US Patent 7,571,600 (issued August 11, 2009).

Westport Fuel Systems Canada Inc.
EX 2004
Mercedes-Benz USA, LLC v.
Westport Fuel Systems Canada Inc.
IPR2023-00351
Page 5 of 16

Academic Research and Teaching Accomplishments

Held a fully tenured professorship in mechanical engineering at West Virginia University. Recipient of 3 major honors from the American Society of Mechanical Engineers (ASME) [Member since 1991], Society of Automotive Engineers (SAE) [Member since 1991] and National Science Foundation (NSF). Responsible for over $2.5M in research funding and expenditures (1991-2000 and 2009-2011) in the clean energy area. Author of 22 archival peer-reviewed journal papers and over 70 peer-reviewed conference papers.

Scholarly Record

Google Scholar: *h* = 27, *citations* = 2450 (March 2022).

IV. HONORS AND AWARDS

Fellow of the Society of Automotive Engineers (SAE). Elected 2018.

Fellow of the American Society of Mechanical Engineers (ASME). Elected 2016.

Recipient of National Science Foundation FutureCar Advisors Award (NSF), 1999 (in conjunction with the American Society for Engineering Education, ASEE).

Recipient of Ralph Teetor Award, Society of Automotive Engineers (SAE), 1994.

Recipient of Lewis F. Moody Award, American Society of Mechanical Engineers (ASME), 1993.

V. PATENTS AND PATENT APPLICATIONS

US Patent 7,571,600 (issued August 11, 2009). Method and apparatus for reducing pollutants in engine exhaust. Inventors: N.N. Clark and C.M. Atkinson. Assigned to West Virginia University Research Corporation.

US Application No. 20110264353 A1. Model-based optimized engine control. Inventors: C.M. Atkinson, M.C. Allain, A. Kropp. Assigned to Detroit Diesel Corporation. (Referenced by 18 international patents and patent applications).

US Application No. 20160160787 A1. Controller for controlling an internal combustion engine of a vehicle, in particular a commercial vehicle. Inventors: M.C. Allain, C.M. Atkinson, P. Attema. Assigned to Daimler AG.

Westport Fuel Systems Canada Inc.
EX 2004
Mercedes-Benz USA, LLC v. Westport Fuel Systems Canada Inc.
IPR2023-00351
Page 6 of 16

VI. JOURNAL PUBLICATIONS

SPANGHER, L.*, W. GORMAN*, G. BAUER*, Y. XU, and C.M. ATKINSON, "Quantifying the Impact of US Electric Vehicle Sales on Light-Duty Vehicle Fleet CO2 Emissions Using a Novel Agent-based Simulation", Transportation Research Part D: Transport and Environment, Vol. 72, 2019, pp. 358-377.

CLARK, N.N., J.M. KERN*, C.M. ATKINSON and R.D. NINE*, "Factors Affecting Heavy-Duty Diesel Vehicle Emissions", Journal of the Air and Waste Management Association, Vol. 52, 2002, pp. 84-94. [Cited 152 times in archival, peer-reviewed publications].

YACOUB*, Y. and C.M. ATKINSON, "Evaluation of Oxides of Nitrogen Emissions for the Purpose of their Transient Regulation from a Direct Injection Diesel Engine", International Journal of Vehicle Design: Heavy Vehicle Systems, Vol. 8, Nos. 3-4, 2001.

THOMPSON, G.J., C.M. ATKINSON, N.N. CLARK, T. LONG and E. HANZEVACK, "Neural Network Modeling of the Emissions and Performance of a Heavy-Duty Diesel Engine", Proceedings of the Institution of Mechanical Engineers. Part D, Journal of Automobile Engineering, Vol. 214, 1999, pp. 111-126. [Cited 135 times in archival, peer-reviewed publications].

CLARK, N.N., C.M. ATKINSON, G.J. THOMPSON and R.D. NINE*[1], "Transient Emissions Comparisons of Alternative Compression Ignition Fuels", Transactions of the Society of Automotive Engineers, Journal of Fuels and Lubricants, Vol. 108, 1999, pp. 468-482. [Cited 52 times in archival, peer-reviewed publications].

ATKINSON, C.M., G. J. THOMPSON, M.L. TRAVER* and N.N. CLARK, "In-Cylinder Combustion Characteristics of Fischer-Tropsch and Conventional Diesel Fuels in a Heavy Duty CI Engine" Transactions of the Society of Automotive Engineers, Journal of Fuels and Lubricants, Vol. 108, 1999, pp. 813-836. [Cited 75 times in archival, peer-reviewed publications].

CLARK, N.N., R. P. JARRETT* and C.M. ATKINSON, "Field Measurements of Particulate Matter Emissions and Exhaust Opacity from Heavy Duty Vehicles", Journal of the Air and Waste Management Association, Vol.49, 1999, pp. 76-84. [Cited 59 times in archival, peer-reviewed publications].

ATKINSON, C.M., S. PETREANU*, N.N. CLARK, R.J. ATKINSON, T. McDANIEL, S. NANDKUMAR*, and P. FAMOURI, "Numerical Simulation of a Two-Stroke Linear Engine-Alternator Combination", Transactions of the Society of Automotive Engineers, Journal of Engines, Vol. 108, 1999, pp. 1416-1430. [Cited 155 times in archival, peer-reviewed publications].

[1] * denotes student author.

Westport Fuel Systems Canada Inc.
EX 2004
Mercedes-Benz USA, LLC v. Westport Fuel Systems Canada Inc.
IPR2023-00351
Page 7 of 16

CAWTHORNE*, W.R., P. FAMOURI, J. CHEN*, N.N. CLARK, T. McDANIEL, R.J. ATKINSON, S. NANDKUMAR*, C.M. ATKINSON, and S. PETREANU*, "Development of a Linear Alternator-Engine for Hybrid Electric Vehicle Applications". IEEE Transactions on Vehicular Technology, Vol. 48, No. 6, 1999, pp. 1797-180. [Cited 128 times in archival, peer-reviewed publications].

YACOUB*, Y. and C.M. ATKINSON, "Modularity in Spark Ignited Engines: A Review of its Benefits, Implementation and Limitations", Transactions of the Society of Automotive Engineers, Journal of Engines, Vol. 107, 1998, pp. 2255-2266. [Cited 13 times in archival, peer-reviewed publications].

VII. RECENT TECHNICAL PRESENTATIONS

ARPA-E Summit, "Next Generation Energy Efficiency Technologies for Connected and Automated Vehicles", February 29, 2016. In a presentation to 2400 participants, I presented the outline and justification for what became the NEXTCAR program at ARPA-E, a $35 million funding program to develop next-generation energy efficiency technologies for connected and automated vehicles.

6th International Conference on Engine Simulation and Testing, IAV GmbH, "Data-Driven Engine Modeling for Transient Control and Calibration", May 2014, Berlin, Germany.

3rd Conference on Design of Experiments (DoE) in Engine Development, "Rapid Transient Calibration Optimization using Data-driven Techniques", September 2014, Plymouth, MI.

SAE 2014 High Efficiency IC Engine Symposium, "Model-Based Control, Calibration and Optimization of High Efficiency Engines". March 2014, Detroit, MI.

SAE 2013 High Efficiency IC Engine Symposium, "Next Generation Engine Control, Calibration and Optimization". March 2013, Detroit, MI.

University of Wisconsin-Madison, Engine Research Center, "Next Generation Engine Control", January 2013.

SAE 2012 Heavy-Duty Engine Efficiency Symposium, "Model-Based Engine Control, Calibration and Virtual Sensing for Fuel Efficiency and Emissions Optimization". October 2012, Chicago, IL.

US Department of Energy Directions in Engine-Efficiency and Emissions Research (DEER) Conference 2012, "Super Truck Engine Control: Model-Based Control for On-Board Fuel Efficiency Optimization", with M. Allain, K. Sisken and C. Savonen (poster).

US Department of Energy Directions in Engine-Efficiency and Emissions Research (DEER) Conference 2010, "Model-Based Diesel Engine Control with On-Board Fuel Efficiency Optimization", with M. Allain.

Westport Fuel Systems Canada Inc.
EX 2004
Mercedes-Benz USA, LLC v. Westport Fuel Systems Canada Inc.
IPR2023-00351
Page 8 of 16

US Department of Energy Directions in Engine-Efficiency and Emissions Research (DEER) Conference 2007, "Fuel Efficiency and Emissions Optimization of Heavy-Duty Diesel Engines Using Model-Based Transient Calibration", with M. Allain, H. Zhang, Y. Kalish and C. Savonen.

VIII. RECENT INVITED CORPORATE PRESENTATIONS

Continental Automotive Systems, "Recent Advances in Model-Based Methods for Engine Development", May 2014, Regensburg, Germany.

Navistar Inc., "Rapid Transient Calibration for High Fuel Efficiency and Ultra-low Emissions Engines", March 2011, Chicago, IL.

Volvo Car Corporation, "Rapid Transient Methods for Diesel Passenger Cars", May 2009, Torslanda, Sweden.

John Deere, "Model-Based Methods for Engine and Aftertreatment Control and Calibration". June 2006, Waterloo, IA.

Eaton Corporation, "Model-Based Methods for Engine and Aftertreatment Control and Diagnostics". May 2006, Southfield, MI.

Delphi Corporation, "Model-Based Engine Control, Diagnostics and Simulation". September 2004, Troy, MI.

Johnson Matthey, "Engine Modeling, Control, Calibration and Virtual Sensing". March 2004, Gothenburg, Sweden.

IX. RECENT REVIEW ACTIVITIES

USEPA Phase 2 Medium and Heavy Duty GHG Emissions Regulations 2015.

US Department of Energy Office of Vehicle Technologies Merit Review 2007-2019.

California Energy Commission PIER Program 2005-2012.

SAE Congress Technical Series Paper Reviewer 2001-2019.

Journal of Engine Research Reviewer 2012-2014.

Westport Fuel Systems Canada Inc.
EX 2004
Mercedes-Benz USA, LLC v. Westport Fuel Systems Canada Inc.
IPR2023-00351
Page 9 of 16

X. REFEREED CONFERENCE PUBLICATIONS

P. Schaberg and C.M. Atkinson, "Calibration Optimization of a Heavy-Duty Diesel Engine with GTL Diesel Fuel", SAE Congress, SAE 2016-01-0622.

C.M. Atkinson, "Fuel Efficiency Optimization using Rapid Transient Calibration", SAE Commercial Vehicle Congress, SAE 2014-01-2359.

C.M. Atkinson, M. Allain, Y. Khalish and H. Zhang, "Model-Based Control of Diesel Engines for Fuel Efficiency Optimization", SAE Congress, SAE 2009-01-0727.

C.M. Atkinson, M. Allain and H. Zhang, "Using Model-Based Rapid Transient Calibration to Reduce Fuel Consumption and Emissions in Diesel Engines", SAE Congress, SAE 2008-01-1365.

C.M. Atkinson and G.E. Mott, "Dynamic Model-Based Calibration Optimization: An Introduction and Application to Diesel Engines", SAE Congress, SAE 2005-01-0026. [Cited 52 times in archival, peer-reviewed publications].

C.M. Atkinson, S. Taylor*[2], J. Conley*, J. Smith*, B. Clay*, R. Waters* and C. Toth-Nagy8, "The Development of a Fourth-Generation Hybrid Electric Vehicle at West Virginia University", SAE Congress, SAE 2001-01-0682.

M.L. Traver*, R.J. Atkinson and C.M. Atkinson, "Neural Network-based Diesel Engine Emissions Prediction Using In-Cylinder Combustion Pressure". SAE Spring Fuels and Lubricants Meeting, Dearborn, MI, May 1999. (SAE 1999-01-1532).

C.M. Atkinson, G. J. Thompson, M.L. Traver* and N.N. Clark, "In-Cylinder Combustion Characteristics of Fischer-Tropsch and Conventional Diesel Fuels in a Heavy Duty CI Engine". SAE Spring Fuels and Lubricants Meeting, Dearborn, MI, May 1999. SAE Paper No. 1999-01-1472.

Y. Yacoub* and C.M. Atkinson, "An Air Cycle Analysis of Alternatives to Throttling in the Otto Cycle Engine", Published in the Proceedings of the 1999 ASME Spring Internal Combustion Engine Conference, Columbus, IN, April 1999.

[2] * denotes student author.

Westport Fuel Systems Canada Inc.
EX 2004
Mercedes-Benz USA, LLC v. Westport Fuel Systems Canada Inc.
IPR2023-00351
Page 10 of 16

C.M. Atkinson, S. Petreanu*, N.N. Clark, R.J. Atkinson, T. McDaniel, S. Nandkumar*, and P. Famouri, "Numerical Simulation of a Two-Stroke Linear Engine-Alternator Combination", SAE Congress, Detroit, MI, February 1999. SAE Paper No. 1999-01-0921.

N.N. Clark, C.M. Atkinson, G. J. Thompson, and R.D. Nine*, "Transient Emissions Comparisons of Alternative Compression Ignition Fuels", SAE Congress, Detroit, MI, February. SAE Paper No. 1999-01-1117.

N.N. Clark, J. J. Daley*, R.D. Nine* and C.M. Atkinson, "Application of the New City-Suburban Heavy Vehicle Route (CSHVR) to Truck Emissions Characterization", SAE Fuels and Lubricants Meeting, Dearborn, MI, May 1999. SAE Paper No. 1999-01-1467.

T. Kelly, D. Spuckler, G. Sverdrup, P. Callahan, N.N. Clark, J.M. Kern*, C.M. Atkinson, R.D. Nine*, M. Mullen and J. Wilson, "Review of Air Quality Impacts from Diesel and Gasoline Powered Vehicles". Proceedings of the 9th CRC On-Road Emissions Conference, San Diego, April 1999.

C.M. Atkinson, N.N. Clark and D. W. Lyons, "Emissions Reduction Benefits of Fischer-Tropsch and Other Alternative Liquid Fuels in Heavy-Duty Diesel Engines". Proceedings of the 9th CRC On-Road Emissions Conference, San Diego, April 1999.

N.N. Clark, R.D. Nine*, C.M. Atkinson, and M. Gautam, "Effect of Test Cycles on Measured Emissions of Diesel Vehicles". Proceedings of the 9th CRC On-Road Emissions Conference, San Diego, April 1999.

N.N. Clark, M. Gautam, D. W. Lyons, C.M. Atkinson, W.W. Xie, P. Norton, K. Vertin, S.P. Goguen and J. Eberhardt, "On-Road Use of Fischer-Tropsch Diesel Blends", 1999 SAE Government/Industry Meeting, Washington, DC, April 1999. SAE Paper No. 1999-01-2251.

T. Park*, R.J. Atkinson, N.N. Clark, M.L. Trave*r and C.M. Atkinson, "Operation of a Compression Ignition Engine with a HEUI Injection System on Natural Gas with Diesel Pilot Injection" SAE Fall Fuels and Lubricants Meeting, Toronto, Ont., October 1999. SAE Paper No. 1999-01-3522.

P. Famouri, W. R. Cawthorne*, N.N. Clark, S. Nandkumar*, C.M. Atkinson, R. J. Atkinson, T. McDaniel, and S. Petreanu*, "Design and Testing of a Novel Linear Alternator and Engine System for Remote Power Generation". Proceedings of the 1999 IEEE Power Engineering Society Winter Meeting, New York, NY, pp. 108-112.

C.M. Atkinson, N.N. Clark, T. Long and E. Hanzevack, "Neural Network-based Vehicle Emissions Modeling for Inventory Applications: An Update on Virtual Sensing". Proceedings of the 8th CRC On-Road Emissions Conference, San Diego, April 1998.

N.N. Clark, R.D. Nine*, J.J. Daley*, C.M. Atkinson, C.J. Tennant*, D.W. Lyons, W.H. Peerenboom and V.A. Suski, "Heavy Duty Truck Emissions, Driving Routes and NO/NO_2 Ratios". Proceedings of the 8th CRC On-Road Emissions Conference, San Diego, April 1998.

Westport Fuel Systems Canada Inc.
EX 2004
Mercedes-Benz USA, LLC v. Westport Fuel Systems Canada Inc.
IPR2023-00351
Page 11 of 16

N.N. Clark, T. I. McDaniel, R. J. Atkinson, S. Nandkumar*, C. M. Atkinson, S. Petreanu*, C.J. Tennant* and P. Famouri, " Modeling and Development of a Linear Engine", Proceedings of the 1998 Spring Technical Conference of the ASME Internal Combustion Engine Division, Fort Lauderdale, FL, ICE-Vol. 30-2

N.N. Clark, S. Nandkumar*, C.M. Atkinson, R. J. Atkinson, T. I. McDaniel, S. Petreanu*, P. Famouri, and W. R. Cawthorne*, "Operation of a Small Bore Linear Two-Stroke Engine", ASME Fall Internal Combustion Engine Conference, Clymer NY, September 1998. Paper No. 98-ICE-120. In Engine Design and Combustion (T. Uzkan, editor) ICE Vol. 31-1, pp. 33-42.

Y. Yacoub* and C.M. Atkinson, "Modularity in Spark Ignited Engines: A Review of its Benefits, Implementation and Limitations". SAE Fall Fuels and Lubricants Conference, San Francisco, CA. October 1998. SAE Paper No. 982688

R. Ramamurthy*, N.N. Clark, C.M. Atkinson, and D.W. Lyons, "Models for Predicting Transient Heavy Duty Vehicle Emissions". SAE Fall Fuels and Lubricants Conference, San Francisco, CA. October 1998. SAE Paper No. 982652.

W.S. Wayne, N.N. Clark and C.M. Atkinson, "Numerical Prediction of Knock in a Bi-Fuel Engine". SAE Fall Fuels and Lubricants Conference, San Francisco, CA. October 1998. SAE Paper No. 982533.

C.M. Atkinson, T.W. Long and E.L. Hanzevack, "Virtual Sensing: A Neural Network-based Intelligent Performance and Emissions Prediction System for On-Board Diagnostics and Engine Control". SAE 980516, SAE International Congress, Detroit, MI, 1998. Also published in Electronic Engine Controls 1998: Diagnostics and Controls, SAE Special Publication SP-1357.

N.N. Clark, R.P. Jarrett* and C.M. Atkinson, "Field Measurements of Particulate Matter Emissions and Exhaust Opacity from Heavy Duty Vehicles", PM2.5 Fine Particle Standard Conference, Air and Waste Management Association/EPA International Specialty Conference, Long Beach, CA, January 28-30, 1998.

C.M. Atkinson and W. Taylor*, "Going Ultra Low". Published in Electric & Hybrid Vehicle Technology '97, UK & International Press, 1998.

W. Taylor*, W. Kellermeyer*, R. Napier*, B. Ralston*, M. Snoberger* and C.M. Atkinson, "Development and Testing of a Second Generation ULEV Series HEV at West Virginia University". SAE Paper No. 980489, SAE International Congress, Detroit, MI, 1998.

W. S. Wayne*, N.N. Clark and C.M. Atkinson, "A Parametric Study of Knock Control Strategies for a Bi-Fuel Engine". SAE Paper No. 980895, SAE International Congress, Detroit, MI, 1998. Also published in SI Engine Combustion, SAE Special Publication SP-1315.

Westport Fuel Systems Canada Inc.
EX 2004
Mercedes-Benz USA, LLC v. Westport Fuel Systems Canada Inc.
IPR2023-00351
Page 12 of 16

C.M. Atkinson, “Advanced Engine Control for General Aviation Engines” Published in the Proceedings of the Second International Conference on Alternative Aviation Fuels, Baylor University, Waco, TX, November 1997.

N.N. Clark, D.W. Lyons, W. Wang, M. Gautam and C.M. Atkinson, “Emissions from Buses using New Generation Natural Gas Engines". Published in Proceedings of the Annual Automotive Technology Development Customers' Coordination Meeting. November, 1997, Vol. III, pp. 491-497.

N.N. Clark, C.M. Atkinson, R.D. Nine*, J.J. Daley*, W.H. Peerenboom and V.A. Suski, “Development of a Heavy Duty Chassis Dynamometer Driving Route”. Published in Proceedings of the Annual Automotive Technology Development Customers' Coordination Meeting. November, 1997, Vol. III, pp. 499-504.

C.M. Atkinson, “Neural Network-based Intelligent Engine Control for Reducing NOx and PM Emissions from CIDI Engines”. Proceedings of the 1997 Diesel Engine Emissions Reduction Workshop, San Diego, CA, July 1997.

E.L. Hanzevack, T.W. Long, C.M. Atkinson and M.L. Traver*, “Virtual Sensors for Spark Ignition Engines Using Neural Networks”. Proceedings of the American Control Conference, Albuquerque NM, June 1997.

C.M. Atkinson, N.N. Clark, T. Long and E. Hanzevack, “Virtual Sensing: A Neural Network-based Emissions Prediction and Modeling System for Inventory Applications”. Proceedings of the 7th CRC On-Road Emissions Conference, San Diego, April 1997.

C.M. Atkinson, "Feasible Design Strategies for Near-Term Hybrid Electric Vehicles". SAE Paper No. 970805. SAE Congress, Detroit, MI, 1997.

W. Taylor*, J. Ingram*, T. Spencer*, W. Kellermeyer* and C.M. Atkinson, "The Development of a Second Generation Series Hybrid Electric Vehicle at West Virginia University". Published in 1996 FutureCar Challenge, SAE Special Publication SP-1234, 1997.

D.W. Lyons, W. Wang, N.N. Clark, R.M. Bata, M. Gautam and C.M. Atkinson, "Heavy Duty Transportable Dynamometer Emissions Testing Laboratory". Published in Proceedings of the Annual Automotive Technology Development Customers' Coordination Meeting. Oct. 28-Nov. 1, 1996.

R.D. Nine*, C.M. Atkinson, D.L. McKain, L. El-Gazzar, N.N. Clark, and D.W. Lyons, "Speciation of Diesel Exhaust from a Medium Duty Diesel Engine". SAE Paper No. 960322. SAE Congress, Detroit, MI, 1996. Also in SAE Special Publication SP-1159.

Westport Fuel Systems Canada Inc.
EX 2004
Mercedes-Benz USA, LLC v. Westport Fuel Systems Canada Inc.
IPR2023-00351
Page 13 of 16

C.M. Atkinson, "The Design and Development of a Flexible Fueled Hybrid Electric Vehicle (FFV-HEV)". Published in the Proceedings of the llth International Symposium on Alcohol Fuels, South Africa, April 1996.

R.D. Nine*, N.N. Clark, C.M. Atkinson, G.E. Mott* and B.E. Mace*, "Speciation of Reactive Components of Lean Burn CNG Exhaust Emissions". Poster Presentation, Windsor Workshop on Alternative Fuels, Toronto, June 1996.

N.N. Clark, C.M. Atkinson, D.W. Lyons, G.E. Mott*, R.J. Atkinson and T.E. Latvakoski*, "Closed Loop Fueling Control for A Lean Burn Natural Gas Engine," Poster Presentation, Windsor Workshop on Alternative Fuels, Toronto, June 1996.

C.M. Atkinson, N.N. Clark and D.W. Lyons, "An Estimation of the Comparative Contribution of Heavy-Duty Diesel Buses and Trucks to Mobile Source Emissions", Proceedings of the 6th CRC On-Road Emissions Conference, San Diego, March 1996.

A.W. Gertler, J.C. Sagebiel, W.R. Pierson, C.M. Atkinson and N.N. Clark, "On-Road Chassis Dynamometer and Engine-out Dynamometer Measurements of Heavy-Duty Vehicle Emissions Factors". Proceedings of the A&WMA Conference on the Emissions Inventory: Programs and Progress, RTP, NC 11-13 October 1995. Air & Waste Management Association, Pittsburgh PA.

D.L. McKain, C.M. Atkinson, L. El-Gazzar, D.W. Lyons and N.N. Clark, "Speciation of Exhaust from Low Emissions Diesel Engines", SAE Paper No. 950253. SAE Congress, Detroit, MI, 1995.

C.M. Atkinson, M.L. Traver*, C.J. Tennant*, R.J. Atkinson and N.N. Clark, "Exhaust Emissions and Combustion Stability in a Bi-Fuel Spark Ignition Engine", SAE Paper No. 950468. SAE Congress, Detroit, MI, 1995.

C.J. Tennant*, R.J. Atkinson, M.L. Traver*, W.S. Wayne*, C.M. Atkinson and N.N. Clark, "Design of a Bi-Fuel Engine which avoids the Penalties Associated with Natural Gas Operation", SAE Paper No. 950679. SAE Congress, Detroit, MI, 1995.

G.E. Mott*, C.M. Atkinson, N.N. Clark, R.J. Atkinson, R.J. deJong*, T.E. Latvakoski* and D.W. Lyons, "Effect of Fuel Composition on the Operation of a Lean Burn Natural Gas Engine". SAE 952560. SAE Fuels and Lubricants Meeting, Toronto, Canada, October 1995 and SAE Alternative Fuels Conference, San Diego, December 1995.

C.M. Atkinson and W. Taylor*, "The Design and Development of an Efficient Series Hybrid Electric Vehicle at West Virginia University". Published in Design Innovations in Electric and Hybrid Electric Vehicles, SAE Special Publication SP-1103, 1995.

C.J. Tennant*, R.J. Atkinson, M.L. Traver*, C.M. Atkinson and N.N. Clark, "A Bi-Fuel Engine for the Transition to CNG Usage". Published in Alternative Fuels and Natural Gas, ICE-Vol. 25-3, the

Westport Fuel Systems Canada Inc.
EX 2004
Mercedes-Benz USA, LLC v.
Westport Fuel Systems Canada Inc.
IPR2023-00351
Page 14 of 16

Proceedings of the 1995 Fall Technical Conference of the ASME Internal Combustion Engine Division.

G.E. Mott*, C.M. Atkinson, N.N. Clark and R.J. Atkinson, "Closed Loop Engine Control for a Turbocharged Lean Burn Natural Gas Engine". Published in Simulations, Controls and Lubrication, ICE-Vol. 25-2, the Proceedings of the 1995 Fall Technical Conference of ASME Internal Combustion Engine Division.

C.M. Atkinson, N.N. Clark, D.L. McKain, L. El-Gazzar and D.W. Lyons, "Speciation of Heavy Duty Engine Exhaust Emissions". Published in Proceedings of the Fifth Coordinating Research Council On-Road Vehicle Emissions Workshop, San Diego, CA, April 1995.

C.J. Tennant, R.J. Atkinson, M.L. Traver*, C.M. Atkinson and N.N. Clark, "Turbocharging a Bi-fuel Engine for Equivalent Performance with CNG", SAE Paper No. 942003. Published in Developments in Alternative Fuels Technology, SAE Special Publication SP-1052. SAE Fuels and Lubricants Meeting, Baltimore, MD, 1994.

R.J. Atkinson, C.J. Tennant*, M.L. Traver*, C.M. Atkinson and N.N. Clark, "A Controller for a Bi-Fuel Gasoline/Natural Gas Engine", SAE Paper No. 942004. Published in Developments in Alternative Fuels Technology. SAE Special Publication SP-1052, SAE Fuels and Lubricants Meeting, Baltimore, MD, 1994.

C.J. Tennant*, R.J. deJong*, R.J. Atkinson, M.L. Traver*, C.M. Atkinson, C. Vincent*, N.N. Clark and D.W. Lyons, "Performance of a High Speed Engine with Dual Fuel Capability", SAE Paper No. 940517. Published in Advanced Powerplant Concepts, SAE Special Publication SP-1038, SAE Congress, Detroit, MI, 1994.

N.N. Clark, C.M. Atkinson, D.W. Lyons, G.E. Mott*, R.J. Atkinson and R.J. deJong*, "Development of a Closed Loop Fuel Management System for a Lean Burn Natural Gas Engine". Published in Proceedings of the Annual Automotive Technology Development Contractors' Coordination Meeting. Also in SAE Special Publication P-289, 1994, pp. 539-549.

D.W. Lyons, N.N. Clark, C.M. Atkinson, R.M. Bata, W. Wang, M. Gautam and G.M. Palmer, "Heavy Duty Vehicle Emissions: Research in Speciation and Results from the WVU Transportable Laboratory". Published in Proceedings of the Fourth Coordinating Research Council On-Road Vehicle Emissions Workshop, San Diego, CA, March 1994.

N.N. Clark, D.L. McKain* and C.M. Atkinson, "Development of a Chassis Driving Cycle Comparable to the Federal Test Procedure for Heavy Duty Engines". Published in Proceedings of the Fourth Coordinating Research Council On-Road Vehicle Emissions Workshop, San Diego, CA, March 1994.

Westport Fuel Systems Canada Inc.
EX 2004
Mercedes-Benz USA, LLC v. Westport Fuel Systems Canada Inc.
IPR2023-00351
Page 15 of 16

C.M. Atkinson and H.K. Kytömaa, "Dynamic Permeability in Multiphase Systems as a Measure of Microstructure", Twelfth U.S. National Congress of Applied Mechanics, Seattle, June 1994. (Abstract).

P. Famouri and C.M. Atkinson, "West Virginia University's Hybrid Electric Vehicle Design Approach". Published in Innovations in Design: 1993 Ford Hybrid Electric Vehicle Challenge, SAE Special Publication SP-980, 1993.

D.W. Lyons, C.M. Atkinson, R.M. Bata, I. Celik, N.N. Clark, M. Gautam, E. Johnson, J.L. Loth, K. Means, C.M. Palmer and W. Wang, "Vehicle and Emissions Testing, Characterization and Control". Published in Proceedings of the Annual Automotive Technology Development Contractors' Coordination Meeting. Also in SAE Special Publication P-278, 1993, pp. 231-238.

C.M. Atkinson, D.W. Lyons, N.N. Clark, C.M. Palmer, M. Gautam, W. Wang, R. Data and D.L. McKain, "In-Use Emissions Profiles of Diesel and Alternative Fueled Heavy Duty Vehicles". Published in Proceedings of the 1993 US DOE Diesel Engine Emission Reduction Workshop, La Jolla, 1993, pp.11-33.

D.W. Lyons, C.M. Atkinson, R.M. Bata, I. Celik, N.N. Clark, M. Gautam, E.K. Johnson, K.H. Means, G.M. Palmer and W. Wang, "In-Use Emissions Profiles of Heavy Duty Alternative Fueled Engines". Published in Proceedings of the Annual Automotive Technology Development Contractors' Coordination Meeting, 1992, pp. 181-192. Also in SAE Special Publication P-265.

Westport Fuel Systems Canada Inc.
EX 2004
Mercedes-Benz USA, LLC v. Westport Fuel Systems Canada Inc.
IPR2023-00351
Page 16 of 16