Daniel B. Olsen, PhD, PE

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EDUCATION

PhD Mechanical Engineering, Colorado State University, May 1999
MS Mechanical Engineering, Oregon State University, March 1990
BS Physics, Eastern Oregon State College, June 1987

PE License, State of Colorado, #38140.

EXPERIENCE

Professor, Mechanical Engineering Department

Colorado State University, Fort Collins, CO
Assistant Professor 2006-2012; Associate Professor 2012-2018; Full Professor 2018-present
Research in the area of applied thermal science. Project management, engineering analysis, experimental evaluation, data analysis, and report and proposal writing in support of internal combustion engine research programs. Emphasis on emissions reduction and efficiency improvement for industrial (bore 20 to 48 cm) natural gas engines. Teaching duties include MECH237 Introduction to Thermal Science, MECH337 Thermodynamics, MECH 338 Thermal/Fluid Sciences Laboratory, MECH342 Mechanics and Thermodynamics of Flow Processes, MECH344 Heat and Mass Transfer, MECH437 Introduction to Internal Combustion Engines, MECH505 Steam Power Plants, MECH538 Thermodynamics, MECH557 Turbomachinery, MECH505 Steam Power Plants, and MECH661 Theory/Control - Internal Combustion Engines.

Consulting, 1999 - present

Los Alamos National Labs: Performed thermal analysis, heat exchanger modeling, and heat exchanger design in support of thermo-acoustic natural gas liquefier development.
Cryenco, Inc.: Consulting in support of a DOE 500 gpd natural gas liquefier program. Functioned as an integral part of design team at Cryenco, with primary responsibility for design of the natural gas burner subsystem.
Enginuity, LLC: Performed compressible flow analysis in support of natural gas fuel injector design.
Advanced Engine Technologies Corporation: Analytical and modeling in support of program with Orange County Sanitation District to reduce formaldehyde emissions from large bore 4-stroke engines used for power generation.
Coerr Environmental Corporation: Write technical memorandum titled "Pilot Fuel Ignition Systems for Reciprocating Internal Combustion Natural Gas Engines" ultimately to be used for EPA input in the classification of engines operating with pilot fuel ignition systems.
Malcolm Pirnie, Inc.: Performed review of Catalytic Oxidizer/Gas Cleaning Drawing Package.
Wärtsilä Automation North America, Inc.: Safety review of retrofit Bi-Fuel system for Diesel engines.
Davis, Graham, & Stubbs LLP: Testified as an expert witness in O-zone rulemaking hearing.
Dresser-Rand Enginuity: Provide technical and market analysis for specification of electronic prechamber fuel valve.
Pipeline Research Council International: Carry out literature review and engineering analysis focused on large bore natural gas engine technology.
FACTOR[e]: Performance and reliability evaluation of anaerobic digester system with emphasis on gaseous fuel engine generator set.
Radical Combustion Technologies NG LLC: Evaluate new combustion technologies, review technical papers and patents, and provide input on technology development plans for industrial natural gas engines.

Research Scientist, Engines and Energy Conversion Laboratory, www.engr.colostate.edu/eecl/

Colorado State University, Fort Collins, CO, May 1999 to August 2006

Research in the area of applied thermal science. Project management, engineering analysis, experimental evaluation, data analysis, and report and proposal writing in support of industrial natural gas engine (bore 20 to 48 cm) research programs. Teaching duties include Introduction to Thermal Science ME237 and ME337, Heat and Mass Transfer ME344, and Introduction to Internal Combustion Engines ME437.

Ph.D. Candidate/Research Assistant in Mechanical Engineering (Thermal Science)

Colorado State University, Fort Collins, CO, June 1995 to May 1999

Research in the area of combustion science. Ph.D. dissertation title: "Experimental and Theoretical Development of a Tracer Gas Method for 2-Stroke and 4-Stroke Internal Combustion Engines". Dissertation work includes tracer gas chemical kinetic modeling with Chemkin-II and application of the tracer gas method for measuring trapping efficiency to a large-bore 2-stroke natural gas IC engine and an automotive size 4-stroke gasoline IC engine.

Experience with a Superflow SF-730 data acquisition system, SF-801 water brake dynamometer, and engine combustion analysis. Projects not directly related to dissertation include preliminary design of an engine humidity control system, flow visualization of gas fuel injector flow with bromine gas, IC engine model development for a 6-stroke cycle, and formaldehyde formation analysis in natural gas IC engines. Carried out literature reviews on formaldehyde formation in large-bore natural gas engines and on mixing in large-bore natural gas engines. Participated in in-cylinder sampling testing on large-bore natural gas engine to study formaldehyde formation and scavenging. Other projects include a literature review on parametric emission monitoring (PEMS), catalyst testing and evaluation on a large-bore natural gas engine, and data analysis and report writing for in-cylinder sampling test data.

Mechanical Engineer, Fluid Handling Product Development

Micropump Corporation, Vancouver, WA, February 1994 to May 1995

Lead engineer for development of centrifugal pumps for cooling x-ray tubes; participated in developing a low flow piston pump for chemical metering and gear pumps for kidney dialysis machines; developed a gear pump controlled with an integral oval gear flowmeter.

Design Engineer, Mechanical Cryocooler Development

Ball Aerospace, Boulder, CO, March 1992 to February 1994

Performed contamination analysis (included diffusion analysis to predict outgassing of non-metallics, testing gas samples with a gas chromatograph (GC), and analyzing GC test data to identify and quantify contamination constituents), flexural bearing characterization, and fault tree reliability analysis on a 30 Kelvin Stirling cryocooler; wrote a Quick BASIC program for communicating with the cryocooler electronics module via an RS-232 interface; mechanical design and thermal and vibration analysis for integrating a Stirling cryocooler to a germanium sensor; contamination analysis and gas purification system sizing and testing for a 3.5 W 65 K Joule-Thompson cryocooler.

Engineer, Mechanical Cryocooler Development

Stirling Technology Company, Richland, WA, March 1990 to February 1992

Responsibility for design, analysis, test and evaluation of thermodynamic, mechanical and electromechanical systems; layout design, support analysis, detail design, assembling, testing and evaluation for dual opposed Stirling cryocooler compressors; designed a vibration balance motor for an 80 K Stirling cryocooler expander; thermodynamic and vibration testing for an 80 K Stirling cryocooler; developed a 1/3 W, 80 K pulse tube cryocooler (included numerical modeling, parametric design, layout design, detail design, assembly, instrumenting, test and evaluation, and report writing).

Masters Student/Teaching Assistant, Mechanical Engineering

Oregon State University, Corvallis, OR, October 1988 to March 1990

Teaching Assistant in the Mechanical Engineering Department. Masters Project was to analyze the dynamic stability of a man powered three wheel vehicle by solving the system differential equation set, mapping the effects of design parameters on stability, and proposing adjustments to the design.

Engineer, Compressor Design

University of Washington Tri-Cities, Richland, WA, June 1989 to Dec. 1989

Layout design, support analysis, detail design, assembly, testing and evaluation for a Stirling cryocooler research compressor.

Research Engineer, Semi-conductor Device Analysis

Matrix Sciences Inc., Richland, WA, Dec. 1988 to Sept. 1989
Semiconductor device (solar cell) testing; computer code development for numerical analysis of semi-conductor performance.

NORCUS Appointee, Computer Programming

Battelle Northwest, Richland, WA, June 1987 to Oct. 1987
FORTRAN computer code development on a VAX computer for numerical simulation in radiation dosimetry; data analysis of computer generated data.

NORCUS Appointee, Engineering Assistant

United Nuclear Corp., Richland, WA, June 1985 to Sept. 1985
Lotus 123-program development for inventory on cranes and hoists; drafting and detail design for an electric motor test stand.

PATENTS

Carl D. Beckett, Kevin O'Hara, Daniel B. Olsen, Steven E. Soar, and Glenn E. Siemer, "Axial Cam Driven Valve Arrangement for an Axial Cam Driven Parallel Piston Pump System", U.S. Patent No. 5,733,105, March 31, 1998.

Carl D. Beckett, Kevin O'Hara, and Daniel B. Olsen, "Rotary Control Valve for a Piston Pump", U.S. Patent No. 5,718,570, Feb. 17, 1998.

Todd Bandhauer, Thomas Bradley, Daniel B. Olsen, Troy Holland, and Jonas Alder, "Ultra-high temperature engine waste heat recovery system", U.S. Patent No. 62, 146, 699, April 13,2015.

Robert Braun, Todd Bandhauer, Daniel B. Olsen, and Bret Windom, "High Efficiency Solid Oxide Fuel Cell – Internal Combustion Engine Hybrid Power System", U.S. Patent No. 11,145,880 B2, October 12th, 2021.

Michael J. Manfredi, Daniel B. Olsen, and Randall R. Raymer, "Systems, Apparatus, and Methods for Inducing Enhanced Radical Ignition in Internal Combustion Engines Using a Radical Chemicals Generator", World Intellectual Property Organization, No. WO 2021/146550 A1, July 22nd, 2021.

David T. Montgomery, Daniel B. Olsen, "ENGINE SYSTEM HAVING RECUPERATED CATALYST IN EXHAUST SYSTEM AND METHOD", US Patent Application 24-1027US01, 2024.

PUBLICATIONS

JOURNALS

1. Olsen, D. B., Puzinauskas, P. and Dautrabande, O., "Development and Evaluation of Tracer Gas Methods for Measuring Trapping Efficiency in 4-Stroke Engines", *SAE Transactions*, Volume 107-4, Paper No. 981382, 1998.
2. Mitchell, Charles E. and Olsen, Daniel B., "Formaldehyde Formation in Large Bore Natural Gas Engines Part 1: Formation Mechanisms", *Journal of Engineering for Gas Turbines and Power*, Volume 122, Issue 4, pp. 603-610, October 2000.
3. Olsen, Daniel B. and Mitchell, Charles E., "Formaldehyde Formation in Large Bore Engines Part 2: Factors Affecting Measured CH2O", *Journal of Engineering for Gas Turbines and Power*, Volume 122, Issue 4 pp. 611-616, October 2000.
4. Olsen, Daniel B., Holden, Jason C., Hutcherson, Gary C. and Willson, Bryan D., "Formaldehyde Characterization Utilizing In-Cylinder Sampling in a Large Bore Natural Gas Engine", *Journal of Engineering for Gas Turbines and Power*, Volume 123, Issue 3, pp. 669-676, July 2001.
5. Olsen, D. B., Hutcherson, G. C., Willson, B. D., and Mitchell, C. E., "Development of the Tracer Gas Method for Large Bore Natural Gas Engines: Part 1 – Method Validation", *Journal of Engineering for Gas Turbines and Power*, Volume 124, Issue 3 pp. 678-685, July 2002.

6. Olsen, D. B., Hutcherson, G. C., Willson, B. D., and Mitchell, C. E., "Development of the Tracer Gas Method for Large Bore Natural Gas Engines: Part 2 – Measurement of Scavenging Parameters", *Journal of Engineering for Gas Turbines and Power*, Volume 124, Issue 3 pp. 686-694, July 2002.

7. Puzinauskas, P.V., Olsen, D.B. and Willson, B.D., "Mass Integration of Fast-Response NO Measurements for a Two-Stroke Large-Bore Natural Gas Engine", *International Journal of Engine Research*, Vol. 4, No. 3, 2003.

8. Puzinauskas, P.V., Olsen, D.B. and Willson, B.D., "Cycle Resolved NO Measurements in a Two-Stroke Large Bore Natural Gas Engine", *Journal of Engineering for Gas Turbines and Power*, Vol. 126, 2004.

9. DeFoort, M., Olsen, D. and Willson, B., "The Effect of Air/Fuel Ratio Control Strategies on Nitrogen Compound Formation in 3-Way Catalysts", *International Journal of Engine Research*, Vol. 5, No. 1, 2004.

10. K Evans, D Olsen, and B Willson, "Fuel and Ignition Control Methodologies for Engines with Articulated Connecting Rods", *International Journal of Engine Research*, Vol. 6, No. 3, pp. 207-214, 2005.

11. Jessica Adair, Daniel Olsen and Allan Kirkpatrick, "Exhaust Tuning for Large Bore 2-Stroke Cycle Natural Gas Engines", *International Journal of Engine Research*, Vol. 7, Issue 2, pp. 131-141, Apr. 2006.

12. Jess W. Gingrich, Daniel B. Olsen, Paulius Puzinauskas and Bryan D. Willson, "Precombustion Chamber NOx Emission Contribution to an Industrial High-Speed, Natural Gas Engine", *International Journal of Engine Research*, Vol. 7 Issue 1, pp. 41-49, Feb. 2006.

13. Olsen, D.B. and Kirkpatrick, A.T., "Experimental Examination of Prechamber Heat Release in a Large Bore Natural Gas Engine", *Journal of Engineering for Gas Turbines and Power*, Vol. 130, No. 5, September 2008.

14. Olsen, D.B. and Lisowski, J.M., "Prechamber NOx formation in low BMEP 2-stroke cycle natural gas engines", *Applied Thermal Engineering*, Vol. 29, pp. 687-694, 2009.

15. Malenshek M., Olsen D.B., "Methane number testing of alternative gaseous fuels", *Fuel*, Volume 88, pp. 650-656, 2009.

16. Sachin Joshi, Daniel B. Olsen, Cosmin Dumitrescu, Paulius V. Puzinauskas, Azer P. Yalin, "Laser Induced Breakdown Spectroscopy for In-Cylinder Equivalence Ratio Measurements in Laser Ignited Natural Gas Engines", *Applied Spectroscopy*, Volume 63, Number 5, 2009.

17. Simpson, D. and Olsen, D.B., "Precombustion Chamber Design for Low NOx Emissions from Large Bore NG Engines" *Journal of Engineering for Gas Turbines and Power*, Vol. 132, No. 12, August 2010.

18. Olsen, Daniel B., Kohls, Morgan and Arney, Gregg, "Impact of Oxidation Catalysts on Exhaust NO2/NOx Ratio from Lean-burn Natural Gas Engines", *Journal of the Air & Waste Management Association*, Volume 60, July 2010.

19. Joshua Schmitt and Daniel B. Olsen, "Control of an Industrial SCR Catalyst Using Ceramic NOx Sensors", *Energy and Power Engineering*, Vol. 3, pp. 317-324, 2011.
http://www.scirp.org/journal/PaperInformation.aspx?PaperID=6435

20. Daniel B. Olsen and Bryan D. Willson, "The Effect of Retrofit Technologies on Formaldehyde Emissions from a Large Bore Natural Gas Engine", *Energy and Power Engineering*, Vol. 3, pp. 574-579, 2011.
http://www.scirp.org/journal/PaperInformation.aspx?PaperID=7390

21. David A Hodgson, Peter M Young, Charles W Anderson, Douglas C Hittle, William S Duff, and Daniel B Olsen, "Using Steady State Predictions to Improve the Transient Response of a Water to Air Heat Exchanger", *ASHRAE Transactions*, Vol. 118, No. 2, 2012.

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23. Aparna Arunachalam and Daniel B. Olsen, "Experimental Evaluation of Knock Characteristics of Producer Gas", *Biomass and Bioenergy*, Vol. 37, pp.169-176, February 2012.

24. A. Lakshminarayanan, D. B. Olsen, and P.E. Cabot, "Performance and Emission Evaluation of Triglyceride-Gasoline Blends in Agricultural Compression Ignition Engines", *Applied Engineering in Agriculture*, Vol. 30 (4), pp. 523-534, 2014.

25. Nettles-Anderson, S., Olsen, D.B., Johnson, J.J. and Enjalbert, J.-N., "Performance of a Direct Injection IC Engine on SVO and Biodiesel from Multiple Feedstocks", *Journal of Power and Energy Engineering*, Vol. 2, No. 8, 2014. http://dx.doi.org/10.4236/jpee.2014.28001.

26. A. Drenth, D. B. Olsen, P. E. Cabot, and J. J. Johnson, "Compression Ignition Engine Performance and Emission Evaluation of Industrial Oilseed Biofuel Feedstocks Camelina, Carinata, and Pennycress Across Three Fuel Pathways", *Fuel*, Vol. 136, pp. 143-155, 2014.

27. Brie Hawley, Christian L'Orange, Daniel B. Olsen, Anthony J. Marchese, and John Volckens. "Oxidative Stress and Aromatic Hydrocarbon Response of Human Bronchial Epithelial Cells Exposed to Petro- or Biodiesel Exhaust Treated with a Diesel Particulate Filter", *Toxicological Sciences,* Vol. 141(2), pp. 505-514, July 2014.

28. Clay Bell, Daniel Zimmerle, Daniel Olsen, Thomas Bradley, and, Peter Young, "Dynamic Turbocharged Diesel Engine Model with Experimental Validation", *Journal of Engineering for Gas Turbines and Power*, Manuscript in Review, Submitted June 2015.

29. Wan Nurdiyana Wan Mansor, Daniel Olsen, and Jennifer Vaughn, "Computation Modeling of Diesel and Dual Fuel Engine Using Converge CFD", *Jurnal Teknologi*, Vol. 72, No. 1, 2015.

30. A.C. Drenth, D.B. Olsen, and K. Denef, "Fuel property quantification of triglyceride blends with an emphasis on industrial oilseeds camelina, carinata, and pennycress", *Fuel*, Vol. 153, pp. 19-30, August 2015.

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32. A. C. Drenth, K. Denef, P. E. Cabot, and D. B. Olsen, "Evaluation of Industrial Corn Oil as an On-Farm Biofuel Feedstock", *Applied Engineering in Agriculture*, Vol. 31 (5), 2015.

33. Wan Nurdiyana W.M, Jennifer V. and Daniel O., "Effects of Diesel Displacement on the Emissions Characteristics of a Diesel Derivative Dual Fuel Engine", *Journal of Engineering and Applied Sciences*, Asian Research Publishing Network, Vol. 10, No. 20, November, 2015.

34. Clay Bell, Daniel Zimmerle, Thomas Bradley, Daniel Olsen, and Peter Young, "Scalable turbocharger performance maps for dynamic state-based engine models", *International Journal of Engine Research*, Vol. 17 (7), pp. 705-712, 2016.

35. Wan Nurdiyana Wan Mansor and Daniel B. Olsen, "Computational Modeling of Diesel and Dual Fuel Combustion Using Converge CFD Software", *Journal of Engineering and Applied Sciences*, Asian Research Publishing Network, Vol. 11, No. 23, Dec. 2016.

36. Juan Pablo GÓMEZ MONTOYA, Andrés A. AMELL, and Daniel B. OLSEN, "Prediction and measurement of the critical compression ratio and methane number for blends of biogas with methane, propane and hydrogen", *Fuel*, Vol. 186, pp. 168-175, 2016.

37. John W. Ladd, Daniel B. Olsen, and Greg Beshouri, "Evaluation of operating parameters and fuel composition on knock in large bore two-stroke pipeline engines", *Fuel*, Vol. 202, No. 15, pp. 165–174, 2017.

38. Yong Lu and Daniel B. Olsen, "Optimization Method and Simulation Study of a Diesel Engine Using Full Variable Valve Motions", *Journal of Engineering for Gas Turbines and Power*, Vol. 139, No. 7, 2017.

39. Robert H. Mitchell and Daniel B. Olsen, "Extending Substitution Limits of a Diesel-Natural Gas Dual Fuel Engine", *Journal of Energy Resources Technology*, Vol. 140, No. 5, 2018.

40. Wan Nurdiyana Wan Mansor, Noor Zaitun Yahaya, Samsuri Abdullah, Nurul Adyani Ghazali, Marzuki Ismail, Sureena Abdullah, Jennifer Vaughn and Daniel B. Olsen, "Engine Performance, Combustion and Emissions Evaluations of a Diesel Natural Gas Dual Fuel Engine", *ARPN Journal of Engineering and Applied Sciences*, Vol. 13, No. 23, 2018.

41. Juan Pablo Gómez Montoya, Daniel B. Olsen, and Andrés A. Amell, "Engine operation just above and below the knocking threshold, using a blend of biogas and natural gas", *Energy,* Vol. 153, pp. 719-725, 2018.

42. Kurt Azevedo and Daniel B. Olsen, "System Engineering Risk Analysis of Diesel Engine Durability in Latin America", *System Engineering*, Vol. 21, No. 4, pp. 345-357, 2018.

43. Marc E. Baumgardner and Daniel B. Olsen, "Performance Degradation and Poison Build-Up of an Oxidation Catalyst in Two-Stroke Natural Gas Engine Exhaust", *Journal of Energy Resources Technology*, Vol. 140, No. 7, 2018.

44. Fan Zeng, John Finke, Daniel Olsen, Angelica White, and Keith L. Hohn, "Modeling of Three-way Catalytic Converter Performance with Exhaust Mixtures from Dithering Natural Gas-fueled Engines", *Chemical Engineering Journal*, Vol. 352, pp. 389-404, 2018.

45. Juan Pablo GÓMEZ MONTOYA, Andrés A. AMELL, Daniel B. OLSEN and German J. Amador Diaz, "Strategies to improve the performance of a spark ignition engine by using fuel blends of biogas, natural gas, propane and hydrogen", *International Journal of Hydrogen Energy*, Vol. 43, No. 45, pp. 21592-21602, 2018.

46. Kurt Azevedo and Daniel B. Olsen, "Engine Oil Degradation Analysis of Construction Equipment in Latin America", *Journal of Quality in Maintenance Engineering*, Vol 25, No. 2, pp. 294-313, 2019.

47. Kurt Azevedo and Daniel B. Olsen, "Construction Equipment Engine Performance Degradation due to Environmental and Operation Factors in Latin America", *Journal of Quality in Maintenance Engineering*, 2019.

48. Juan Pablo Gómez Montoya, Daniel B. Olsen, et al., "Operation of a Spark Ignition Engine With High Compression Ratio Using Biogas Blended With Natural Gas, Propane, and Hydrogen", *Journal of Engineering for Gas Turbines and Power*, Vol. 141, May 2019.

49. German J. Amador Diaz, Juan Pablo GÓMEZ MONTOYA, Lesme A. Corredor Martinez, Daniel B. Olsen and Adalberto Salazar Navarro, "Influence of Engine Operating Conditions on Combustion Parameters in a Spark Ignited Internal Combustion Engine Fueled with Blends of Methane and Hydrogen", *Energy Conversion and Management*, Vol. 181, pp. 414-424, 2019.

50. German J. Amador Diaz, Lesme A. Corredor Martinez, Juan P. Gomez Montoya, and Daniel B. Olsen, "Methane Number Measurement of Hydrogen/Carbon Monoxide Mixtures Diluted with Carbon Dioxide for Syngas Spark Ignited Internal Combustion Applications", *Fuel*, Vol. 236, pp. 535-543, 2019.

51. Chris A. Van Roekel, David T. Montgomery, Jaswinder Singh, and Daniel B. Olsen, "Evaluating Dedicated Exhaust Gas Recirculation on a Stoichiometric Industrial Natural Gas Engine", *International Journal of Engine Research*, 2019.

52. David Grassian and Daniel Olsen, "Lifecycle Energy Accounting of Three Small Offshore Oil Fields", *Energies*, Vol. 12, Issue 14, 2019.

53. David Grassian, Daniel Olsen, "Detailed Energy Accounting of Electrical Submersible Pumping Systems", *Energies*, Vol. 13, Issue 2, 2020.

54. Wan Nurdiyana Wan Mansor, Samsuri Abdullah, Mohammad Nor Khasbi Jarkoni, Jennifer S. Vaughn, Daniel B. Olsen, "Data on combustion, performance and emissions of a 6.8L, 6-cylinder, Tier II diesel engine", *Elsevier: Data in Brief*, 2020.

55. David Grassian and Daniel B. Olsen, "Practical Applications of Net Energy Analysis of Upstream Oil and Gas Processes", *Journal of Energy Resources Technology*, Vol. 143, 2021.

56. Brenna King, Mukund Venkitachalam, and Daniel Olsen, "Experimental Evaluation of Volatile Organic Compound Quantification Methods for Reciprocating Natural Gas Engines", *Journal of Energy Resources Technology*, Vol. 143, July 2021.

57. Chris A. Van Roekel, David T. Montgomery, Jaswinder Singh, and Daniel B. Olsen, "Response Surface Method Optimization of a Natural Gas Engine with Dedicated Exhaust Gas Recirculation", *International Journal of Engine Research*, March, 2021.

58. Diego Bestel, Scott Bayliff, Hui Xu, Anthony Marchese, Daniel Olsen, Bret Windom, "Investigation of the End-Gas Autoignition Process in Natural Gas Engines and Evaluation of the Methane Number Index", *Proceedings of the Combustion Institute*, Volume 38, Issue 4, 5839–5847, 2021.

59. Andrew Zdanowicz, Jeffrey Mohr, Jessica Tryner, Kara Gustafson, Bret Windom, Daniel B. Olsen, Gregory Hampson, and Anthony J. Marchese, "End-gas autoignition fraction and flame propagation rate in laser-ignited primary reference fuel mixtures at elevated temperature and pressure", *Combustion and Flame,* Vol. 234, 2021.

60. Van Roekel, C.A., Montgomery, D.T., Singh, J. and Olsen, D.B., "Analysis of Non-Selective Catalyst Reduction Performance with Dedicated Exhaust Gas Recirculation", *Advances in Chemical Engineering and Science*, Vol. 12, 2022.

61. Tanmay Kar, Toluwalase Fosudo, Anthony Marchese, Bret Windom, and Daniel Olsen, "Effect of fuel composition and EGR on spark-ignited engine combustion with LPG fueling: Experimental and numerical investigation", *Fuel,* Vol. 327, 2022.

62. Felipe Rodriguez, J., Xu, H. , Hampson, G. , Windom, B. , Marchese, A. and B. Olsen, D., "Heavy Duty Natural Gas Single Cylinder Research Engine Installation, Commissioning, and Baseline Testing", *Energy and Power Engineering*, **14**, 217-232. doi: 10.4236/epe.2022.146012, 2022.

63. Andrew Huonder and Daniel Olsen, "Methane Emission Reduction Technologies for Natural Gas Engines: A Review", *Energies*, 16 (20), 7054, *Energies* 2023; **https://doi.org/10.3390/en16207054**.

64. R.J. Braun, G. Floerchinger, N. Sullivan, T. Vincent, R. Danforth, T. Bandhauer, S. Garland, D. Olsen, "Development Progress of a 70% Efficient Hybrid SOFC-I.C. Engine Hybrid System for Stationary Applications up to 1 MW", *ECS Transactions*, Vol. 111 (6), 699-705, 2023.

65. Toluwalase Fosudo, Tanmay Kar, Bret Windom, and Daniel Olsen, "Low-carbon fuels for spark-ignited engines: A comparative study of compressed natural gas and liquefied petroleum gas on a CFR engine with exhaust gas recirculation", *Fuel*, Vol. 360, 2024.

66. Patterson, Mark. A, Xie, Nelson, Beurlot, Kyle, Jacobs, Timothy, and Olsen, Daniel, "Analysis of Unburned Methane Emission Mechanisms in Large-Bore Natural Gas Engines with Prechamber Ignition", *Journal of Engineering for Gas Turbines and Power*, 2024; https://doi.org/10.1115/1.4065313.

67. Hernando A. Yepes, Colin Slunecka, Adalberto Salazar, Bret Windom, Daniel B. Olsen, Anthony J. Marchese, and German Amador, "Laminar flame properties correlations for H2/C3H8 mixtures at high temperature and pressure conditions", *Fuel*, Vol. 357, 2024.

68. Nicholas Katsampes, David Montgomery, Gregg Arney and Daniel B. Olsen, "Hydrogen-natural gas fuel blending in a "rich burn" engine with 3-way catalyst", *Frontiers in Fuels*, 2024; https://doi.org/10.3389/ffuel.2024.1416716.

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71. Greg Vieira, Rachel Lorenzen, Mark Patterson and Daniel Olsen, "Methane emission reduction through hydrogen blending in a large bore 2-stroke lean-burn natural gas compressor engine", *Frontiers in Fuels*, 2024; https://doi.org/10.3389/ffuel.2024.1404367.

72. Victor A Reyes-Flores, Zachary Swartwout, Shane Garland, Daniel B Olsen, Bret Windom, Robert Braun and Todd Bandhauer, "Operational Conditions for an Internal Combustion Engine in a 2 SOFC-ICE Hybrid Power Generation System", *Energies*, 17, 2024.

73. Titilope Ibukun Banji, Gregg Arney, Mark Patterson and Daniel B. Olsen, "Reduction of Methane Emissions from Natural Gas Integral Compressor Engines through Fuel Injection Control", *Sustainability*, 16, 5943, 2024; https://doi.org/10.3390/su16145943.

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76. Fosudo, T., Windom, B., and Olsen, D., "Experimental Evaluation of Direct and Port Fuel Injection Strategies on a Heavy-Duty Liquefied Petroleum Gas Engine," SAE Int. J. Engines, Volume 18, Issue 3, 2025. https://doi:10.4271/03-18-03-0022.

77. Arturo Eduardo Quintero, Juan Felipe Rodriguez, Bret Windom, Daniel B Olsen, "Performance Evaluation of Closed Crankcase Ventilation System in an Industrial NG Engine", *Energies*, 18(16), 4415, July 2025, https://doi.org/10.3390/en18164415.

CONFERENCE PROCEEDINGS

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185. Toluwalase Fosudo, Tanmay Kar, Bret Windom, Jacob Schlagel, and Daniel Olsen, “Performance, Combustion and Emissions Evaluation of Liquid Phase Port-Injected LPG on a Single Cylinder Heavy-Duty Spark Ignited Engine,” SAE Technical Paper 2023-01-0245, 2023, doi:10.4271/2023-01-0245.

186. Juan Felipe Rodriguez, Diego Bestel, Hui Xu, Greg Hampson, Bret Windom and Daniel Olsen, “Innovative Piston Design Performance for High Efficiency Stoichiometric Heavy Duty Natural Gas Engine,” SAE Technical Paper 2023-01-0288, 2023, doi:10.4271/2023-01-0288.

187. Arturo E Quintero Castillo, Andrew Zdanowicz, Bret Windom, and Daniel B Olsen, “Characterization of Crankcase Ventilation Gas on Stationary Natural Gas Engines”, Western States Section Combustion Institute Fall Technical Meeting, October 16-17, 2023.

188. Toluwalase Fosudo, Bret Windom, and Daniel Olsen, “Improvements in Performance, Emissions, and Combustion Characteristics of a Heavy-Duty LPG Engine using Direct Liquid Injection”, Western States Section Combustion Institute Fall Technical Meeting, October 16-17, 2023.

189. Titilope Banji, Gregg Arney, Daniel Olsen, “Impact of Fuel Injection Parameters on Performance and Methane Emissions in Large Bore Engines”, Western States Section Combustion Institute Fall Technical Meeting, October 16-17, 2023.

190. Juan Felipe Rodriguez, Brent Windom, and Daniel Olsen, “Emissions of Ultra-High Efficiency Heavy-Duty Natural Gas Engine with C-EGAI”, Western States Section Combustion Institute Fall Technical Meeting, October 16-17, 2023.

191. Titilope I. Banji, Gregory D. Vieira, Mark Patterson, Daniel B. Olsen, "Methane Emission Reduction Strategies for Large Bore Two-Stroke Natural Gas Engines", GMRC Gas Machinery Conference, Oct. 6-9, 2024.

192. Juan Felipe Rodriguez, Nestor Y. Rojas, Bret Windom and Daniel Olsen, "Controlled End-Gas Autoignition Effect on Pollutant Emissions of Ultra-High Efficiency Heavy-Duty Natural Gas Engine", 14th U.S. National Combustion Meeting, Combustion Institute, Boston, Massachusetts, March 16–19, 2025.

193. Arturo Quintero Castillo, Juan Felipe Rodriguez, Bret Windom, Daniel Olsen, "Performance Evaluation of Closed Crankcase Ventilation System in an Industrial NG Engine", 14th U.S. National Combustion Meeting, Combustion Institute, Boston, Massachusetts, March 16–19, 2025.

194. Robin Bremmer, Daniel Olsen, Dawson Baucke, Juan Felipe Rodriquez, and David Lander, "Assessment and status of gaseous fuel rating using the methane number", CIMAC Congress, Paper 110, Zurich, Switzerland, May 19-23, 2025.

Poster Presentations

195. Syndi Nettles-Anderson and Dr. Daniel B. Olsen, "Straight Vegetable Oil Use in Compression Ignition Engines for Agricultural and 3rd World Markets", Poster session presented at: Colorado Center for Biorefining and Biofuels Poster Session, February 2008.

196. Syndi Nettles-Anderson, Dr. Daniel B. Olsen, Dr. Jerry Johnson, and Nicholas Enjalbert, "Engine Durability Testing of Unrefined Straight Vegetable Oil", Poster session presented at: Customized Energy Solutions, April 2011.

197. L. Arunachalam, Dr. Daniel B. and Dr. Perry Cabot, "The Big Squeeze Fuel", Poster session presented at: Arkansas Valley Farm/Ranch/Water Symposium & Trade Show, Feb. 2, 2012.

198. Timothy Vaughn, Aaron Drenth, Arunachalam Lakshminarayanan, Daniel Olsen, Robert McCormick, and Anthony J. Marchese, "Characterization of Gaseous and Particulate Emissions from the Combustion of Cellulosic Biomass Based Oxygenated Components in a Compression Ignition Engine", Poster Session presented at: 35th Combustion Symposium, San Francisco, CA, Aug 3-8, 2014.

199. Juan Felipe Rodriguez, Hui Xu, Greg Hampson, Bret Windom and Daniel Olsen, "Low cost in cylinder pressure sensors for high efficiency natural gas heavy-duty on-road engines", 13th U.S National Combustion Meeting, Combustion Institute, Poster Session, College Station, Texas March 19-22, 2023.

Trade Publications

200. Daniel B. Olsen, Kirk Evans, and Mark Noall, "Micropilot tests progress, durability an issue", *Oil & Gas Journal*, Vol. 104, No. 3, pp. 64-68, 2006.

201. Daniel B. Olsen, Matthew R. Luedeman, and Cody D. Lanham, "Development and Testing of a Timed Power Cylinder Lube Oil Injection System", *Compressor Tech*^{2}, 2015.

202. A.C. Drenth, A. Lakshminarayanan, P.E. Cabot, and D.B. Olsen, "Triglyceride Blends (TGBs) as an Option for On-Farm Fuel Production", CSU Extension Fact Sheet, Farm and Ranch Series, No. 5.011, 2018.

CSU Graduate Students (Primary Advisor)

1. Tassitano, Jim, NO2 Emissions from 2-Stroke Large Bore Natural Gas Engines, Colorado State University, Master's Thesis, 2003.
2. Adair, Jessica, MODELING AND EXHAUST TUNING OF A LARGE BORE TWO-STROKE NATURAL GAS ENGINE, Colorado State University, Master's Thesis, 2004.
3. Ahrens, David L., DEVELOPMENT OF AN OPEN PATH LASER IGNITION SYSTEM FOR A LARGE BORE NATURAL GAS ENGINE, Colorado State University, Master's Thesis, 2005
4. Lentz, Joel, Retrofit technologies for large bore natural gas 4-stroke cycle engines, Colorado State University, Master's Thesis, 2005.

5. Moosman, Ted G., FTIR Spectroscopy for 2-Stroke, Lean Burn Gas Engines Emphasizing Low-Level Detection of HAPs, Colorado State University, Master's Thesis, 2005.
6. Schmitt, Dennis W., FRAME STRESS AND CRANKSHAFT MODAL ANALYSIS ON LARGE BORE NATURAL GAS ENGINES, Colorado State University, Master's Thesis, 2005.
7. Ivaturi, Krishna, EXPERIMENT AL AND CFD INVESTIGATION OF RE-AGENT MIXING IN AN SCRSYSTEM, Colorado State University, Master's Thesis, 2007.
8. Lisowski, Justin M., DIAGNOSTIC TECHNIQUES FOR PRECOMBUSTION CHAMBERS IN LARGE BORE LEAN BURN NATURAL GAS ENGINES, Colorado State University, Master's Thesis, 2007.
9. Malenshek, Martin, METHANE NUMBER TESTING OF ALTERNATIVE GASEOUS FUELS, Colorado State University, Master's Thesis, 2008.
10. Amadu, Sule, Operational Characteristics of a Three-Way Catalyst on a Stationary Natural Gas Engine, Colorado State University, Master's Thesis, 2009.
11. Muktibodh, Aditya S., EFFECT OF FUEL ADDITIVES ON PERFORMANCE AND EMISSIONS FROM INDUSTRIAL DIESEL ENGINES, Colorado State University, Master's Thesis, 2009.
12. Simpson, Dean J., PRECOMBUSTION CHAMBER DESIGN FOR EMISSIONS REDUCTION FROM INDUSTRIAL NATURAL GAS ENGINES, Colorado State University, Master's Thesis, 2009.
13. Srivatsan, Guhan, COMPARISON OF TWO STROKE RETROFIT TECHNOLOGIES, Colorado State University, Master's Thesis, 2009.
14. Wilson, Brett, METHANE NUMBER AND EMISSIONS TESTING OF ALTERNATIVE GASEOUS FUEL FIELD SAMPLES, Colorado State University, Master's Thesis, 2009.
15. Arunachalam, Aparna, EXPERIMENTAL & ANALYTICAL EVALUATION OF KNOCK CHARACTERISTICS OF PRODUCER GAS, Colorado State University, Master's Thesis, 2010.
16. Ruter, Matthew D., LARGE BORE NATURAL GAS ENGINE PERFORMANCE IMPROVEMENTS AND COMBUSTION STABILIZATION THROUGH REFORMED NATURAL GAS PRECOMBUSTION CHAMBER FUELING, Colorado State University, Master's Thesis, 2010.
17. Schmitt, Joshua C., SELECTIVE CATALYTIC REDUCTION: TESTING, NUMERIC MODELING, AND CONTROL STRATEGIES, Colorado State University, Master's Thesis, 2010.
18. Whitley, Kevin, INVESTIGATION OF SUPERTURBOCHARGER PERFORMANCE IMPROVEMENTS THROUGH STEADY STATE ENGINE SIMULATION, Colorado State University, Master's Thesis, 2010.
19. Cirincione, Nicholas, DESIGN, CONSTRUCTION AND COMMISSIONING OF AN ORGANIC RANKINE CYCLE WASTE HEAT RECOVERY SYSTEM WITH A TESLA-HYBRID TURBINE EXPANDER, Master's Thesis, 2012.
20. Badrinarayanan, Koushik, PERFORMANCE EVALUATION OF MULTIPLE OXIDATION CATALYSTS ON A LEAN BURN NATURAL GAS ENGINE, Colorado State University, Master's Thesis, 2012.
21. Gattoni, John, ADVANCED CONTROL TECHNIQUES AND SENSORS FOR GAS ENGINES WITH NSCR, Colorado State University, Master's Thesis, 2012.
22. Paris, Amy, INCREASING BMEP FOR DOWNSIZING OF INTERNAL COMBUSTION ENGINES THROUGH AN ADVANCED TURBOCHARGING CONCEPT, Colorado State University, Master's Thesis, 2012.
23. Kochuparampil, Roshan J., PERFORMANCE EVALUATION OF AN ADVANCED AIR-FUEL RATIO CONTROLLER ON A STATIONARY, RICH-BURN NATURAL GAS ENGINE, Colorado State University, Master's Thesis, 2013.
24. Luedeman, Matthew R., OPTIMIZING POWER CYLINDER LUBRICATION ON A LARGE BORE NATURAL GAS ENGINE, Colorado State University, Master's Thesis, 2013.
25. Sutley, Franklin H., INSTALLATION AND TESTING OF A CUMMINS QSK19 LEAN BURN NATURAL GAS ENGINE, Colorado State University, Master's Thesis, 2013.

26. Wise, Daniel M., INVESTIGATION INTO PRODUCER GAS UTILIZATION IN HIGH PERFORMANCE NATURAL GAS ENGINES, Colorado State University, Master's Thesis, 2013.
27. Lakshminarayanan, Arunachalam, TESTING AND PREFORMANCE MEASUREMENT OF STRAIGHT VEGETABLE OILS AS AN ALTERNATIVE FUEL FOR DIESEL ENGINES, Colorado State University, Master's Thesis, 2014.
28. Mansor, Wan Nurdiyana Wan, DUAL FUEL ENGINE COMBUSTION AND EMISSIONS – AN EXPERIMENTAL INVESTIGATION COUPLED WITH COMPUTER SIMULATION, Colorado State University, Master's Thesis, 2014.
29. Davis, Kristen, OXIDATION CATALYST DEGRADATION IN THE EXHAUST STREAM OF A LARGE BORE 2-STROKE NATURAL GAS ENGINE, Colorado State University, PhD. Dissertation, 2015.
30. Drenth, Aaron C., ANALYSIS OF INDUSTRIAL OILSEEDS: PRODUCTION, CONVERSION TO BIOFUELS, AND ENGINE PERFORMANCE FROM LARGE TO SMALL SCALE, Colorado State University, Ph D. Dissertation, 2015.
31. Ghotge, Prerana S., IMPACT OF H2-NG BLENDING ON PERFORMANCE AND EMISSIONS OF STOICHIOMETRIC AND LEAN BURN SPARK IGNITED ENGINES, Colorado State University, Master's Thesis, 2016.
32. Ladd, John, CONVERSION OF LOW BMEP 4-CYLINDER TO HIGH BMEP 2-CYLINDER LARGE BORE NATURAL GAS ENGINE, Colorado State University, Master's Thesis, 2016.
33. Page, Christopher B., SIMULATION AND ANALYSIS OF AN 18L NATURAL-GAS ENGINE WITH A FOCUS ON CYLINDER DEACTIVATION AND EXHAUST PRESSURE DYNAMICS, Colorado State University, Master's Thesis, 2016.
34. Mitchell, Robert, INVESTIGATION OF SUSTITUTION LIMITS AND EMISSIONS OFAN IN-LINE SIX CYLINDER DIESELDERIVED DUAL FUEL ENGINE, Colorado State University, Master's Thesis, 2017.
35. Nygren, Troy, NATURAL GAS CONDITIOING WITH A HEAVY HYDROCARBON PERMEABLE POLYMER MEMBRANE, Colorado State University, Master's Thesis, 2017.
36. Roekel, Chris V., EVALUATION OF ETHANOL SUBSTITUTION IN A COMPRESSION IGNITION ENGINE, Colorado State University, Master's Thesis, 2017.
37. Azevedo, Kurt M., IMPROVING CONSTRUCTION MACHINE ENGINE SYSTEM DURABILITY IN LATIN AMERICAN CONDITIONS, Colorado State University, Master's Thesis, 2018.
38. Hackleman, Bryan, TWO-STROKE LEAN BURN NATURAL GAS ENGINE OXIDATION CATALYST DEGRADATION AND REGENERATION VIA WASHING, Colorado State University, Master's Thesis, 2018.
39. Lakshminarayanan, Arunachalam, TECHNICAL AND ECONOMIC EVALUATION OF TRIGLYCERIDE GASOLINE BLENDS AS AN ALTERNATIVE FUEL FOR DIESEL ENGINES, Colorado State University, PhD Dissertation, 2018.
40. Grassian, David, MODELLING AND ANALYSIS OF SYSTEMS ON OFFSHORE OIL AND GAS PLATFORMS, Colorado State University, Ph D. Dissertation, 2019.
41. King, Brenna A., EXPERIMENTAL EVALUATION OF STACK TESTING METHODS FOR ACCURATE VOC MEASUREMENT, Colorado State University, Master's Thesis, 2019.
42. Roekel, Chris V., DEDICATED EXHAUST GAS RECIRCULATION APPLIED TO A RICH BURN INDUSTRIAL NATURAL GAS ENGINE, Colorado State University, PhD Dissertation, 2019.
43. Balu, Alexander, ANALYSIS OF SIMULATED DILUTE ANODE TAIL-GAS COMBUSTION CHARACTERISTICS ON A CFR ENGINE, Colorado State University, Master's Thesis, 2020.
44. Bayliff, Scott Michael, EVALUATION OF CONTROLLED END GAS AUTO IGNITION WITH EXHAUST GAS RECIRCULATION IN A STOICHIOMETRIC, SPARK IGNITED, NATURAL GAS ENGINE, Colorado State University, Master's Thesis, 2020.
45. Countie, Matthew., PREDICTIVE MODELING AND TESTING OF A DIESEL DERIVED SOLID OXIDE FUEL CELL TAIL GAS SPARK-IGNITION ENGINE, Colorado State University, Master's Thesis, 2020.

46. Bauza, Rodrigo, IMPROVED CATALYST REGENERATION PROCESS TO INCREASE POISON REMOVAL AND IMPROVE PERFORMANCE RECOVERY, Colorado State University, Master's Thesis, 2021.
47. Jones, Andrew L., EVALUATION OF ADVANCED AIR-FUEL RATIO CONTROL STRATEGIES AND THEIR EFFECTS ON THREE-WAY CATALYSTS IN A STOICHIOMETRIC, SPARK IGNITED, NATURAL GAS ENGINE, Colorado State University, Master's Thesis, 2021.
48. Zineddin, Khalid Mohamad, EVALUATION OF COMMERCIALLY AVAILABLE ON-LINE ANALYZERS FOR MEASUREMENT OF NATURAL GAS CONTAMINANTS, Colorado State University, Master's Thesis, 2021.
49. Slunecka, Colin, AUTOIGNTION AND FLAME SPEED OF PREMIXED LIQUEFIED PETROLEUM GAS IN A RAPID COMPRESSION MACHINE: EXPERIMENTAL RESULTS AND REDUCED CHEMICAL KINETIC MECHANISM, Colorado State University, Master's Thesis, 2023.
50. Steve Johnson, "Restructuring and Updating Mechanical Engineering Laboratory Course Materials", Colorado State University, Plan B MS Project, 2023.
51. Katsampes, Nicholas, HYDROGEN-NATURAL GAS FUEL BLENDING AND ADVANCED AIR FUEL RATIO CONTROL STRATEGIES IN A "RICH BURN" ENGINE WITH 3-WAY CATALYST, Colorado State University, Master's Thesis, 2023.
52. Bayer, Justin, REDUCTION OF METHANE EMISSIONS WITH HYDROGEN SUBSTITUTION ON A LEAN BURN FOUR STROKE NATURAL GAS ENGINE, Colorado State University, Master's Thesis, 2023.
53. Juan Felipe Rodriguez Rueda, EXPANDING THE KNOCK/EMISSIONS LIMITS FOR THE REALIZATION OF ULTRA-LOW EMISSIONS, HIGH-EFFICIENCY HEAVY-DUTY NATURAL GAS ENGINES, Colorado State University, PhD Dissertation, 2023.
54. Toluwalase Jude Fosudo, DEVELOPMENT OF ADVANCED COMBUSTION STRATEGIES FOR HEAVY DUTY LPG ENGINES TO ACHIEVE NEAR-DIESEL EFFICIENCY, Colorado State University, PhD Dissertation, 2024.
55. Dawson Baucke, "ANALYSIS AND REFINEMENT OF METHANE NUMBER TEST PROCEDURE FOR GASEOUS FUELS", Colorado State University, Master's Thesis, 2024.

CSU Externally Funded Contracts and Grants as Principal Investigator

2025-2026	Good Neighbor Rule – Compliance White Paper, Pipeline Research Council International, $60k.
2025-2026	Field Demonstration of NOx Sensor Feedback Control, Pipeline Research Council International, $120k.
2024-2027	Development and Demonstration of a Medium-Duty Off-Road DME Engine with a Combustion Recipe for Ultra-Low NOx, CoPI Bret Windom, Clemson University $629k (DOE/EERE/VTO $2.5M).
2024-2026	Evaluation of G3516J NG Engine CH4 Reduction Technologies: Low CV Pistons and MOC, Caterpillar, Inc., $175k.
2024-2025	Evaluating Performance, Suitability of Grease Utilized for In-Situ Valve Repairs, CoPI Bret Windom, Pipeline Research Council International, $75k.
2023-2025	The Oxiperator for Methane Slip from Lean Burn Gas Engines and Much More, Prabhu Energy Labs, LLC, $229k (DOE/FECM $1.0M).
2023-2024	Design and Testing of a Multi-Nozzle PCC on a GMV4 LB NG Engine, Pipeline Research Council International, $125k.
2023-2024	Improved In-Cylinder Mixing: Injection Pressure Sensitivity, Pipeline Research Council International, $75k.
2023-2024	Prechamber Air + Fuel Premixing Proof of Concept: GMV CFD Simulation, Pipeline Research Council International, $75k.
2022-2025	Crankcase Gas Rerouting/Filtration System to Reduce Crankcase Methane Emissions from Lean-burn NG Engines, Co-PI Bret Windom, DOE/ARPA-E, $1.675M.

2021-2023	Impact of Hydrogen Blending on a Caterpillar CG137-8 Gas Compression Engine with 3-Way Catalyst, Southern California Gas Company, $173k.
2021-2024	Methane Abatement from Large Bore NG 2-Stroke Cycle Engines Through In-Cylinder Modifications, Pipeline Research Council International, $350k.
2021-2022	Evaluation of New Ignition Concepts on Large Bore NG Engines for Methane Emission Reduction: Phase 1 Engine Simulation, Pipeline Research Council International, $80k.
2020-2024	Development of Advanced Combustion Strategies for Direct Injection Heavy Duty LPG Engines to Achieve Near-Diesel Engine Efficiency, CoPI Bret Windom, DOE/EERE, $3.1M.
2019-2022	Development of Advanced 3-Way Catalyst Control Strategies on a Caterpillar CG137-8 Gas Compression Engine, Caterpillar, Inc., $480k.
2019-2022	Evaluation of Commercially Available On-line Analyzers for Measurement of Multiple Gas Contaminants, CoPI Timothy Vaughn, Pipeline Research Council International, $261k.
2019-2021	CFD Study of Prechamber Ignition Mechanisms for GHG Reduction, Pipeline Research Council International, $85k.
2019-2021	Improved Catalyst Regeneration Process to Increase Poison Removal and Improve Performance Recovery, Pipeline Research Council International, $72k.
2019-2020	Performance Evaluation of Dedicated EGR on a Caterpillar CG137-8 Natural Gas Engine, Caterpillar, Inc., $160k.
2018-2021	Expanding the Knock/Emissions/Misfire Limits for the Realization of Ultra-Low Emissions, High Efficiency Heavy Duty Natural Gas Engines, CoPIs Anthony Marchese and Bret Windom, DOE/EERE, $1.3M.
2018-2020	Experimental Evaluation of Stack Testing Methods for Accurate VOC Measurement, Pipeline Research Council International, $188k.
2018-2019	Experimental Evaluation of a Fuel Cell UUV Power Unit, Siemens Corporation, $80k.
2018-2019	Installation and Commissioning of a Caterpillar CG137-8 Natural Gas Engine, Caterpillar, Inc., $155k.
2017-2018	Evaluation of New Prechamber Head Design on GMV4 Natural Gas Engine, GE Oil & Gas, Inc., $598k.
2017-2019	Optimization of Dedicated EGR on a Caterpillar 3304 NG Engine, Caterpillar, Inc., $360k.
2017-2018	Evaluation of New Prechamber Head Design on GMV4 Natural Gas Engine, GE Oil & Gas, Inc., $287k.
2017-2018	Blue Drive Controller Performance Evaluation on a Cummins QSK50 Tier 4 Diesel Engine, Siemens Corporation, $79k.
2016-2018	Field Evaluation of Oxidation Catalyst Degradation on a 2-Stroke Lean-Burn NG Engine: Catalyst Washing, Pipeline Research Council International, $120k.
2015-2017	Investigation of a Gas Fuel Conditioning System for Alternative Gas Fuels, CoPI Anthony Marchese, Cummins Engine Company, $217k.
2015-2016	Investigation of Dual Fuel and Its Effects on Lubricant Performance, Chevron Oronite Company, LLC, $219k.
2015-2016	NSCR Catalyst Testing in Support of KSU Modeling Effort, Pipeline Research Council International, $40k.
2015-2016	Methane Reduction Data Analysis for 2-Stroke Lean Burn Natural Gas Engines, Pipeline Research Council International, $38k.
2014-2016	Evaluation of Ethanol Substitution in Diesel Engines, Colorado Corn Administrative Committee, cost share from Growth Energy and Front Range Energy, $80k.
2014-2015	Impact of H2-NG Blending on Lambda Sensor NSCR Control and Lean Burn Emissions, Southern California Gas Company, $60k.

2013-2016	Field Evaluation of Timed Power Cylinder Lube Oil Injection, Pipeline Research Council International, $155k.
2013-2015	Field Evaluation of Oxidation Catalyst Degradation on a 2-Stroke Lean-Burn NG Engine, Pipeline Research Council International, $211k.
2013-2015	Variable Fuel Composition Air Fuel Ratio Control of Lean Burn Engines, Pipeline Research Council International, $249k.
2013-2015	Investigation of Corn Based Triglyceride – Gasoline Blends as an Off-Road Diesel Fuel Substitute, Colorado Corn Administrative Committee, $18k.
2013-2014	Improved Energy Efficiency of Natural Gas /Producer Gas Fuel Mixtures, University of California, San Diego, $19k.
2013-2014	Field Evaluation of Continental Controls Corporation NSCR NOx Sensor Control System, Pipeline Research Council International, $77k.
2013-2014	Evaluation of Cylinder Wall Lubrication for Power Cylinder Timed Lube Oil Injection System, Pipeline Research Council International, $85k.
2013-2014	CO Sensor Experimental Evaluation for Catalyst Health Monitoring, Pipeline Research Council International, $42k.
2012-2013	Timed Power Cylinder Lube Oil Injection to Reduce Oil Consumption and Oxidation Catalyst Fouling, $120k.
2012-2014	Energy Meter Performance Assessment, Pipeline Research Council International, $96k.
2011-2012	Investigation of Emission Reduction Techniques for Diesel Derivative Dual Fuel Engines, EnCana Oil & Gas (USA) Inc., $109k.
2011-2012	Evaluation of a New 3-Way Catalyst Configuration on a Volkswagen 2.0 Liter Engine, VanDyne SuperTurbo, Inc., $42k.
2011-2012	Installation and Testing of a Cummins QSK19G 4-Stroke NG Engine, Cummins, Inc., $95k.
2011-2012	Field Evaluation of the Woodward E3 Rich Burn AF Ratio Controller on a High Speed NG Engine, co-PI Christopher L. Hagen, Southern California Gas Company, $61k.
2010-2011	Advanced Control Techniques and Sensors for Gas Engines with NSCR, California Energy Commission/Pipeline Research Council International, $145k.
2010-2011	Experimental Evaluation of Multiple Oxidation Catalysts on a Natural Gas Engine Slipstream, Pipeline Research Council International, $125k.
2010-2011	Evaluation of DeNOx Exhaust Aftertreatment System on a Caterpillar 3516C, EnCana Oil & Gas (USA) Inc., $131k.
2010-2011	Methane Number Measurement and Combustion Characterization of Syngas Blends, Caterpillar, Inc., $240k.
2010-2011	Characterization of Oxidation Catalyst Performance: VOCs and Temperature Variation, Pipeline Research Council International, $120k.
2010-2011	Characterization of Lube Oil Carry Over in a 2-Stroke LB NG Engine, Pipeline Research Council International, $30k.
2009-2011	Caterpillar CG175-1 Four Stroke Engine: Installation and Commissioning, co-PI Azer P. Yalin, Caterpillar, Inc., $262k.
2009-2010	Development of a Syngas PCC for Industrial NG Engines, Rolls-Royce Fuel Cell Systems (US) Inc., $111k.
2009-2010	Product Development Support for an Advanced Turbocharging System, Woodward Governor Company, $129k.
2009-2010	Utilization of Flare Gas for heating and Electrical Generation, Anadarko Petroleum Corporation, $23k.

2008-2011	Engine Durability Testing of Camelina Sativa Derived SVO, co-PI Jerry J. Johnson, CSU Clean Energy Supercluster, $34k.
2008-2009	Straight Vegetable Oil Pilot Project for Colorado Rural Producers, co-PI Jerry J. Johnson, State of Colorado-Governor's Office, $35k.
2008-2009	Experimental Evaluation of a New Prechamber Design on the GMV-4TF Natural Gas Engine, Pipeline Research Council International, $157k.
2007-2009	Evaluation of the Impact of Freedom Fuel Additive on a Caterpillar 3512 and John Deere 6.8 Liter Engines, JBRR Distributing, LLC, $49k.
2008-2009	Evaluation of the Impact of ACES Fuel Additive on a Caterpillar 3512 Engine, ACES – American Clean Energy Systems, Inc., $37k.
2008-2009	Extended SCR Slipstream Testing on a 2-Stroke Lean Burn Engine, Pipeline Research Council International, $100k.
2007-2008	Feasibility Assessment of Operating Existing Natural Gas Reciprocating Engines on Various Alternative Gas Fuels, co-PI Bryan D. Willson, California Energy Commission, $95k.
2007-2008	Evaluation of NOx Sensors for Control of Aftertreatment Devices, Pipeline Research Council International, $21k.
2007-2008	Comparison of NO2 Measurement Techniques for Lean Burn Exhaust", Pipeline Research Council International, $35k.
2007-2008	Evaluation of the Effect of Fuel and Oil Additives on a Waukesha VGF Engine, EnCana Oil & Gas (USA) Inc., $190k.
2007-2008	ADCAT 3-Way Catalyst Testing, EmeraChem, Inc., $60k.
2007-2008	Gas Composition (Low-BTU Fuel) Development Testing on a Cummins GTA8.3 Engine", Cummins Engine Company, $144k.
2007-2008	Performance Evaluation of Fuel Additives on a John Deere 6.8 l Diesel Engine", co-PI Anthony Marchese, EnCana Oil & Gas (USA) Inc., $86k.
2006-2008	NOx Reduction through Improved Precombustion Chamber Design, Pipeline Research Council International, $195k.
2006-2008	NOx Reduction through Improved Exhaust Aftertreatment, Pipeline Research Council International, $198k.
2005-2006	NOX Reduction through Improved Precombustion Chamber Design – Year 1, Pipeline Research Council International, $135k.
2005-2006	Worthington SUTC Baseline Testing for Micropilot Data Comparison, Pipeline Research Council International, $15k.
2005-2006	NOX Reduction through Improved Exhaust After Treatment – Year 1, Pipeline Research Council International, $70k.
2005-2006	Engine Testing of Catalyst Health Monitoring System, Enginuity, LLC/Williams Gas Pipeline, $100k.
2005-2006	Systematic Engine Uprate Technology Development and Deployment for Pipeline Compressor Engines through Increased Torque – Phase I, Department of Energy, $180k.
2004-2006	Systematic Engine Uprate Technology Development and Deployment for Pipeline Compressor Engines, Gas Technology Institute, $341k.
2004-2005	Medium Pressure Fuel Valve Modeling and Experimental Evaluations, Gas Technology Institute, $137k.
2004-2005	Chemical Kinetic Modeling Cyanide Formation in SCR Catalysts, El Paso Energy, $43k.
2004-2005	Laser-Spark Ignition System Development for Pipeline Engines – Year One, Gas Technology Institute/Altronic, Inc., co-PI Azer Yalin, $200k.
2004-2005	FTIR Method Standardization for Pipeline Industry, Gas Technology Institute, $200k.

2004-2005	Development of a Catalyst Health Monitoring Plan and Guidelines for Catalyst Installation as Required by the Turbine and IC MACT Rules, Gas Technology Institute, $40k.
2004-2005	Engine Testing of Optimized Nozzles for High Pressure Injection, Gas Technology Institute, $150k.
2004-2005	Formaldehyde Response to Analyzers Using FIDs, El Paso Energy, $42k.
2003-2005	Combustion Visualization in a Large Bore Natural Gas Engine, Pipeline Research Council International, $250k.
2002-2005	Hydraulically Actuated High-Pressure Fuel Investigations for 4-Stroke Large Bore Engines, Gas Technology Institute, $200k.
2003-2004	Precombustion Chamber Fuel Metering with an Electronic Fuel Valve, Gas Technology Institute, $171k.
2003-2004	Medium Pressure Nozzle Design and Evaluation, Hoerbiger Corporation of America, $10k.
2003-2004	Investigation of Formaldehyde Chemical Kinetics, Pipeline Research Council International, co-PIs Charles Mitchel and Bryan Willson, $100k.
2002-2003	Humidity Control for Power & Emissions, Gas Technology Institute, $250k.
2002-2003	PLIF Imaging of 125 psi Fuel Valve Injection, Enginuity, LLC, $10k.
2002-2003	Fuel Valve Design Using Computational Fluid Dynamics & Laser Diagnostics, Gas Technology Institute, $200k.
2002-2003	Nitrogen Dioxide Emissions from 2-Stroke Large Bore Natural Gas Engines, Gas Technology Institute, $60k.
2002-2003	Fuel & Ignition Control for Articulated Engine Bank Optimization, Gas Technology Institute, $150k.
2001-2002	Emissions Control (Evaluation of Non-symmetric Dithering for A/F Ratio Control in NSCR Catalysts), Gas Technology Institute, $160k.
2001-2003	An Investigation of Mixing & Scavenging in Large Bore (Natural Gas) Engines Using Laser Diagnostics, Pipeline Research Council International, co-PI Bryan Willson, $276k.
2001-2002	Report-Assessment of Estimating Volatile Organic Compounds Emissions Based on Total Hydrocarbon Emissions & Fuel Composition, El Paso Energy, $12k.
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