Jonathan Willocks

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| Applied Catalysis and Emissions Research Group | 865-341-1515 |
| Oak Ridge National Laboratory |  |
| 1 Bethel Valley Rd, Oak Ridge, TN 37830 |  |

## Education

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| Austin Peay State University | May 2019 |
| Bachelor of Science, major in mechanical engineering technology, minor in physics |  |

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| Pellissippi State Community College | Spring 2016 |
| Associate of Applied Science, mechanical engineering technology, magna cum laude |  |

## Professional Experience

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| Oak Ridge National Laboratory | Oak Ridge, Tennessee |
| *Technician* | *September 9, 2019–present* |
| * Runs experiments in a variety of projects as the responsible party * Applies engineering standards to relevant systems * Ensures equipment and instruments are in safe and working order when needed * Solves unforeseen technical challenges that arise for each unique project (e.g., electric control boxes, design and fabrication of unique parts, and with many other project-specific solutions) * Integrates various measurement devices into data acquisition software * Holds responsibility for many day-to-day tasks to keep other projects going (e.g., maintaining gas bottle inventory, ordering laboratory supplies as needed, and maintaining multiple chemical inventories [custodian of 13 control areas]) | |
| Oak Ridge Associated Universities | Oak Ridge, Tennessee |
| Oak Ridge National Laboratory National Transportation  Research Center | |
| *Laboratory Tech Intern* | *August 13, 2016–September 8, 2019* |
| * Assisted in setting up and running experiments * Became familiar with various measurement methods and how to integrate them into various systems * Designed and created custom solutions for various projects, including electrical circuits and panels for controlling equipment and custom metal parts to improve or repair experiments | |
| Oak Ridge Associated Universities | Oak Ridge, Tennessee |
| Oak Ridge National Laboratory Spallation Neutron Source | |
| *Laboratory Tech Intern* | March 7, 2016–August 12, 2016 |
| * Worked with various Sample Environment equipment (cryostats, magnets, and furnaces) used at the Spallation Neutron Source facility * Used existing equipment to create mechanical drawings for reference and for manufacturing new parts * Created drawings for new equipment to be manufactured when problems with existing designs arose | |

## Certifications

* Certified SolidWorks professional
* Certified in SolidWorks advanced drawing tools
* Trained in UL 508A industrial control panels and short circuit current rating standards

## Technical Skills

### CAD

* SolidWorks
* Geometric dimensioning and tolerancing per ANSI standard Y14.5

### Programming

* Python
* LabVIEW
* MATLAB
* Microsoft Office Suite
* Microsoft Project
* C++

### Other

* Machining
* Circuits (alternating current and direct current)
* Working knowledge of Spanish

## Daily Responsibilities

### Gas Cylinder Management

* Holds responsibility for keeping stock of gas cylinders used in chemistry labs
* Changes and manages around 100 gas cylinders annually
* Manages repairs to liquid delivery dewars and gas delivery systems

### Gas Analyzers

* Holds responsibility for troubleshooting and making necessary repairs of the dozens of gas analyzers used in many research projects
* Makes improvements as necessary to gas analyzer benches when projects require custom solutions

## Research Experience

### Wabtec Rail Engine Cooperative Research and Development Agreement (current)

* Holds responsibility for data acquisition system wiring/design
* Redesigns and builds gas analyzer cabinet to suit unique project needs

### CO2 Capture Absorber Intensification (current)

* Designed and manufactured an updated column A system
* Designed and manufactured a new larger column B system
* Designs and builds small, 2 in. column for fundamental testing
* Worked on wiring/troubleshooting of sensors and controls for new larger column setup
* Assists in solving technical issues with system
* Assists in data analysis

### CO2 Capture—Direct Air Capture (current)

* Designed and manufactured new cross flow chamber system
  + Developed plan for sensors and data acquisition system and how to integrate with system
  + Developed data acquisition program for experiment use
  + Assists in data analysis for project

### Electrochemical Seawater Decarbonization (current)

* Designed novel device for an electrochemical cell instrument for experiment (invention disclosure in process)
* Will potentially help to run experiments and provide more support for project in future

### Microwave Moisture Detector (current)

* Designed custom 3D printed pieces critical to project
* Helped solve technical issues that came up during iterations of project

### Magnetic Filter for Uranium (current)

* Redesigned filter apparatus to maximize magnetic field in filter system
* Will assist with running experiment and data acquisition when appropriate for project

### Selenium Removal from Wastewater (current)

* Submitted application for R&D 100 Award
* Designed experimental system used in on-location experiments at the Bull Run Steam Plant
* Assisted researchers in running the experiments and collecting data

### Diesel Genset Ash Loading Project (US Department of Energy Bioenergy Technologies Office Co-Optimization of Fuels and Engines Initiative)

* Holds responsibility for running experiments for the experiments that ran on test engine for the last 5 years
* Updated/improved safety shutdown mechanisms (physical systems and computer-controlled)
* Updated the engine setup to run multiple different experiments throughout the years
* Analyzed data to prepare initial results to be reviewed by principal investigator

### Fuel Injector Neutron Imaging

* Assisted in running the imaging experiment starting in 2016
* Assisted with the design of the updated spray chamber
* Installed multiple new sensors and various equipment throughout the various iterations of the project
* Rebuilt custom 16-channel heater controller that arrived built but not configured correctly and to Oak Ridge National Laboratory electrical standards
  + Rewired all input/output control loops, overlimit/control thermocouple inputs, and control/reset switches
  + Reprogrammed all control loops to get desired operation
* Solved a specific issue that came up during a campaign (instrumental role)

### Neutron Imaging of Methanol Diffusion into Polymethyl Methacrylate at the National Institute of Standards and Technology (NIST)

* Helped install and run the experiment at NIST
* Helped precisely cut samples to be imaged for the project
* Assisted in the troubleshooting of various issues that arose throughout the project

### Hybrid TE Dryer

* Made 3D scan of dryer duct and
* Modeled improvements into the design for 3D printing more optimized geometries
* Assisted in running experiment after modifications were made

### Lab Improvements

* Assisted in setting up new multifunctional cross-directorate lab in L201
* Assisted in making improvements to MR1 and MR3
* Updated LabVIEW code on MR1

### Feedstock Gasification

* Redesigned/improved chamber used at High Flux Isotope Reactor to allow for better measurements and imaging
* Helped with design/setup for second phase work done in laboratory L201

### Electric Drives Research Group

* Provided technical/CAD support for the ODBC power module project
* Helped design/set up new thermal camera gantry capability

### Long Stroke Engine

* Designed and fabricated custom flywheel used for the engine
* Built custom fuel delivery cabinet used on this and future work in test cell

### DD13 Research Engine

* Learned the proprietary control software used in controlling/running the test engine
* Assisted in the setup of sensors and controls for the engine

### Vehicle Security Lab

* Replaced the wheel guards used in the lab with a custom, more versatile, easier-to-adjust system

## Publications

Wissink M., Toops T., Finney C., Nafziger E., Splitter D., Willocks J., “Neutron Imaging of Advanced Transportation Technologies,” US DOE Vehicle Technologies Office 2018 Annual Merit Review, June 2018.

Wissink M., Goldenberger K., Ferguson L., Zhang Y., Bilheux H., LaManna J., Kass M., Finney C., Willocks J., “Fabrication of Black Body Grids by Thick Film Printing for Quantitative Neutron Imaging,” *Journal of Imaging* 8, no. 6, 2022, DOI: 10.3390/jimaging8060164.

Finney C., Tsouris C., Thompson J., Gug G., Jackson A., Deka D., Willocks J., Panagakos G., Girish Y., Bhattacharyya D., “Computational Design and Process Intensification of CO2 Absorbers,” 2022 Carbon Management Project Review Meeting, August 2022.

Tsouris C., Thompson J., Jackson A., Gug G., Deka D., Curran S., Palko S., Willocks J., Case J., Parks J., “Intensified, Flexible, and Modular Carbon Capture Demonstration with Additively Manufactured Multi-Functional Devices,” National Energy Technology Laboratory 2023 Carbon Management Project Review Meeting, August 2023.

Stamberga D., Willocks J., Tsouris C., Custelcean R., “Se-Oxyanion Removal from Coal-Burning Power Plant Wastewaters by Cocrystallization with a Guanidine Ligand,” Science and Technology for Energy Applications, October 2023.

Toops T., Deka D., Lance M., Willocks J., “Emissions Control Catalyst Tolerance to Renewable Fuel-based Phosphorous,” Cross-Cut Lean Exhaust Emissions Reduction Simulations at American Society of Mechanical Engineers Internal Combustion Engine Forward, October 2023.

Toops T., Deka D., Lance M., Willocks J., Partridge W., Pihl J., “Emissions Control Catalyst Tolerance to Renewable Fuel-based Phosphorous,” Clean Fuels Technical Workshop, October 2023.

Tsouris C., Gug G., Deka D., Jackson A., Thompson J., Palko S., Willocks J., Case J., Parks J., “Process Intensification and Scale-Up of CO2 Absorption by Solvents from Point Source Emissions,” 21st Symposium on Separations Science and Technology for Energy Applications, Knoxville, Tennessee, October 2023.

Gug G., Deka D., Jackson A., Thompson J., Willocks J., Palko S., Tsouris C., “Reduction in CO2-Absorption Column Height and Process Intensification Facilitated by Additively Manufactured Intensified Packing Devices,” 2023 American Institute of Chemical Engineers Annual Meeting, November 2023.

Tsouris C., Thompson J., Jackson A., Love L., Gug G., Deka D., Nuttall D., Parks J., Curran S., Palko S., Willocks J., Kaul B., Whitted S., Finney C., Lai C., Case J., Barth G., Zaloudek K., Windsor M., Sun X., “Additive Manufacturing Facilitating Process Intensification of CO2 Capture,” November 2023.

Einkauf J., Stamberga D., Willocks J., Zhuoyi Z., Shen Z., Yiacoumi S., Tsouris C., Custelcean R., “Se-Oxyanion Removal from Coal-Burning Power Plant Wastewaters by Cocrystallization with Chelating Hydrogen Bonding Guanidines,” American Chemical Society National Meeting Spring 2024, March 2024.

## Acknowledgments

Wissink M., Toops T., Finney C., Nafziger E., Splitter D., Bilheux H., An K., Frost M., “An Update on Neutron Diagnostics of Transportation Technologies,” Oak Ridge National Laboratory Net-Zero Carbon Workshop, January 2019.

Finney C., Tsouris C., Smith B., Connatser R., Lewis S., Parks J., “Experimental Validation of Coal Gasification with Neutron Imaging,” 2019 Annual Project Review Meeting for Crosscutting, Rare Earth Elements, Gasification and Transformative Power Generation, April 2019.

Wissink M., Toops T., Finney C., Nafziger E., Splitter D., Bilheux H., Curran S., An K., Frost M., “An Update on Neutron Diagnostics of Transportation Technologies,” August 2019.

Wissink M., Toops T., Finney C., Nafziger E., Splitter D., Bilheux H., Curran S., An K., Frost M., “Neutron Imaging of GDI Internal Dynamics and Update on Other Neutron Projects,” Advanced Engine Combustion Program Review Meeting, February 2020.

Splitter D., Boronat V., Partridge W., “Fuel Effects on Low Speed Pre-Ignition,” March 2020.

Wissink M., “Update on Neutron Diagnostic Tasks,” Advance Engine Combustion Program Review Meeting, August 2020.

Wissink M., “High Speed Neutron Imaging of Fuel Films on Metal Substrates,” International Energy Agency Sprays Workshop, August 2020.

Wissink M., “Spatiotemporal Evolution of Hydrogenous Liquid Films with High-Speed Neutron Imaging,” May 2022.

Wissink M., Kass M., Finney C., LaManna J., Jacobson D., Bilheux H., “Measurement of Time-Resolved Absorption Profiles in PMMA-Methanol System with Neutron Imaging,” American Conference on Neutron Scattering, June 2022.

Jackson A., Tsouris C., Deka D., Gug G., Thompson J., Love L., “Multifunctional Design in Additive Manufacturing: Process Intensification for Enhanced CO2 Capture,” Solid Freeform Fabrication, July 2022.

Tsouris C., Deka D., Gug G., Thompson J., Love L., “Multifunctional Design in Additive Manufacturing: Process Intensification for Enhanced CO2 Capture,” 2022 Annual International Solid Freeform Fabrication Symposium (SFF Symp 2022), July 2022.

Wissink M., Toops T., Splitter D., Nafziger E., Finney C., Bilheux H., Zhang Y., “Measurement of Needle and Armature Dynamics in a Gasoline Direct Injector by High-Speed Neutron Imaging,” Angular Momentum, August 2022.

Tsouris C., “Intensified, Flexible, and Modular Carbon Capture Demonstration with Additively Manufactured Multi-Functional Device,” MS&T22: Materials Science and Technology, August 2022.

Wissink M., Toops T., Splitter D., Nafziger E., Finney C., Bilheux H., Zhang Y., “Measurement of Needle and Armature Dynamics in a Gasoline Direct Injector by High-Speed Neutron Imaging,” THIESEL 2022: Conference on Thermo- and Fluid Dynamics of Clean Propulsion Systems, September 2022.

Wissink M., Toops T., Splitter D., Nafziger E., Finney C., Bilheux H., Zhang Y., “Measurement of Needle and Armature Dynamics in a Gasoline Direct Injector by High-Speed Neutron Imaging,” THIESEL 2022 Conference on Thermo- and Fluid Dynamics of Clean Propulsion Powerplants, September 2022, DOI: 10.4995/Thiesel.2022.632801.

Toops T., Splitter D., Nafziger E., Finney C., Santodonato L., Bilheux H., Wissink M., “Quantification of Sub-Pixel Dynamics in High-Speed Neutron Imaging,” *Journal of Imaging* 8, no. 7, 2022, DOI: 10.3390/jimaging8070201.

Edwards D., Lavertu T., “Decarbonization of Rail Freight Engines,” February 2023.

Edwards D., Nafziger E., Pihl J., Curran S., Klingbeil A., Lavertu T., “Implementing Low Lifecycle Carbon Fuels on Locomotive Engines,” Cooperative Research and Development Agreement with Wabtec, June 2023.

Kaul B., Prikhodko V., Curran S., Pihl J., “Initial Evaluation of Low-Load Dual-Fuel Ammonia Combustion for Marine Applications,” August 2023.

Kasturi A., Gug G., Akin A., Jackson A., Jun J., Stamberga D., Custelcean R., Sholl D., Yiacoumi S., Tsouris C., “An Effective Air–Liquid Contactor for CO2 Direct Air Capture Using Aqueous Solvents,” *Separation and Purification Technology* 324, November 2023, DOI: 10.1016/j.seppur.2023.124398.

Tsouris C., Thompson J., Gug G., Deka D., Jackson A., Parks J., “Scale-Up of Additively Manufactured Structured Packing Device for CO2 Capture,” Annual American Institute of Chemical Engineers Meeting, November 2023.