

BENJAMIN NMAI AFOTEY, PhD, E.I.T, MGHIE

Chemical Engineering Department
College of Engineering
KNUST, Ghana

Phone: 0249312880
Email: afotey_benjamin@hotmail.com
bafotey.coe@knust.edu.gh

WORK EXPERIENCE

Associate Professor, KNUST

Aug.2024 - Present

Senior Lecturer, KNUST

Aug. 2019 – July 2024

Lecturer, KNUST

Nov. 2010 – July 2019

1. i. Undergraduate Courses Taught: Environmental Engineering Technology, Environmental Impact Assessment, Physical Chemistry for Engineers, Mass Transfer Processes, Mechanical Separation Processes, Chemical Process Industries, Chemical Process Design and Economics, Transport Phenomena, Fuel and Combustion Technology, Safety and Pollution Control, Pollution Control in Petrochemical Industries, Strength of Materials for Chemical Engineers

ii. Postgraduate Courses Taught: Environmental Engineering, Fuel and Energy Technology, Oil Refining, Special Topics in Pollution (Gas) Control Technologies, Oil waste Treatment

2. Assessor for Accreditation of Programs: Ghana Tertiary Education Commission (GTEC) (April, 2023 – Current)

3. Faculty Advisor, AWMA KNUST Student Chapter of the West Coast Section (April, 2021 – Current)

4. Committee Member, KNUST Engineering Education Project (January 2021 – January, 2022)

5. Postgraduate Coordinator_ Chemical Engineering Department (August 2018 – January, 2022)

6. Coordinator & Exams Officer – MEng. Oil & Gas (August 2019 – January, 2022)

7. Member; College of Eng. Innovation & Career Fair Committee (August 2018 – January, 2022)

8. Examination Officer – Chemical Engineering Department (June 2011 – Dec. 2013)

9. Field Trip & Industrial Attachment Officer– Chemical Engineering Department (June 2014-Aug., 2018)

10. Coordinator, Institute of Distance learning – Chemical Engineering Department (Jan. 2013 – August 2018)

11. Member; Faculty of Mechanical & Chemical Engineering Quality Assurance Committee

12. Reviewer for Elsevier: Journal of Environmental Chemical Engineering and Journal of Scientific African

13. Member of Collaborative Environmental Research Team, with other members in University of Texas, United States.

Research Area/Interest:

1. Air pollution & control technologies, emissions modeling, emissions measurement;
2. Biofuels, biogas, energy systems and sustainable energy: Capturing landfill's gas for energy needs.
3. Water & wastewater treatment technologies

PUBLICATIONS, CONFERENCE PAPERS & PAPER PRESENTATIONS

- **Benjamin Afotey**, Melanie Sattler, Niloofar Parsaeifard, Yvette E. Pearson, Mithila Chakraborty, Sunakshi Hada (2022): Impact of Corona Virus Stay-at-home Policies on Traffic Emissions and Ambient Pollutant Concentrations in Ghana. *Engineered Science*, Vol. 17, pp 285-291.
- **Benjamin Afotey** and Christina Lovely Quao (2024). Ambient Air Pollution Monitoring and Health Studies Using Low-Cost Internet of Things Monitor within KNUST Community. *Journal of Machine and Computing*, 4(1)(2024), Doi: <https://doi.org/10.53759/7669/jmc202404018>
- Ibrahim Hamidu , **Benjamin Afotey** , Zakaria Ayatul-Lahi (2022): Design and Development of a Low-Cost Sensor Iot Computing Device for Greenhouse Gas Momitor from Selected Industry Locations. *Scalable Computing: Practice and Experience*, Volume 23, Issues 4, pp. 363–376
- **Benjamin Afotey**, Godson Teddyson Sarpong (2022): Estimation of Biogas Production Potential and Greenhouse Gas Emissions Reduction for Sustainable Energy Management using Intelligent Computing Technique. *Measurement: Sensors*, 25(2023)100650. <https://doi.org/10.1016/j.measen.2022.100650>
- **Benjamin Afotey**, Jacob K. Agbenorhevi, Leonard D.K. De-Souza, John K. Logosu, Fidelis M. Kpodo, Kolawole O. Falade (2023). Okra (*Abelmoschus esculentus* L.) pectin yield as influenced by particle size and extraction solvent. *Food Chemistry Advances* 3 (2023) 100339. DOI: <https://doi.org/10.1016/j.focha.2023.100339>
- Tawakalitu AbdulRasheed, **Benjamin Afotey**, Emmanuel Godwin Ankudey and Daniel Adjah Anang (2023). Synthesis and Characterization of Novel Calcium Oxide/Calcium Ferrite, CaO/CaFe₂O₄ Composite Nanocatalyst for Biodiesel Production. *Engineered Science Materials and Manufacturing*, 2023, 22, 922, DOI: <https://dx.doi.org/10.30919/esmm922>
- Daniel A. Anang, Kekeli Anyomi, **Benjamin Afotey**, Mizpah A. D. Rockson, Emmanuela Kwao-Boateng, Edward Antwi and Augustine T. Tagoe (2022): Petrol Filling Station Safety Assessment and Fire Safety Knowledge of Fuel Pump Attendants. *Journal of Ghana Science Association*, Volume 20(2), pp 48 – 54
- Tawakalitu AbdulRasheed, **Benjamin Afotey**, Emmanuel Godwin Ankudey and Daniel Adjah Anang (2024). Fuel Properties and Emission Characteristics of Biodiesel Fuel Produced from Waste Cooking Oil Using CaO/CaFe₂O₄ Catalyst, *Journal of Ghana Science Association*, Vol.21 No.2 2024.
- Tawakalitu AbdulRasheed, **Benjamin Afotey**, and Daniel Adjah Anang (2023). Recent Advances in Methods for Synthesizing Composite Nanocatalysts and Their Applications: A Literature Review. *International Journal of Thin Films Science and Technology*, 13, No. 1, 27-36 (2023), <http://dx.doi.org/10.18576/ijtfst/130104>

- Theophilus Kwesi Shiako, **Benjamin Afotey** (2021); Effect of methyl tertiary butyl ether (MTBE) and ethyl tertiary butyl ether (ETBE) on the properties of gasoline, International Journal of Energy Engineering, Vol.11, No.1, pp 1-8
- **Benjamin Afotey**, Emmanuel Yuorkuu, Simon Y. Akinie, Frederick F. Eshun, Mohammed A. Sufyan (2024). Determination of Health and Nutritional Benefits of Jackfruits (*artocarpus heterophyllus*). Journal of Ghana Institution of Engineering
- **Benjamin Afotey** (2018): Impact Assessment of Metal-Based Octane Boosters: A Literature Review. International Journal of Energy Engineering, Vol.8, No.3, pp 67-88
- **Benjamin Afotey**, Ayatulai Abdul mumin (2018): Assessment of Inhalable Particulate Matter (PM) Associated with a Cement Factory in Tema, Ghana, American Journal of Environmental Engineering, Vol. 8, No. 5, pp 167-173
- Baba Akaribo, **Benjamin Afotey** (2017): Comparative Analysis of Selected Octane Enhancing Fuel Additives as Substitutes to Methylcyclopentadienyl Manganese Tricarbonyl. International Journal of Energy Engineering, Vol.7, No.3, pp 65-73
- Michael N. Worfa, Moses Mensah, **Benjamin Afotey**, Samson P. Salifu (2017): Effects of Different Sets of *Pleurotus ostreatus* and *Aspergillus niger* Hydrolysis of Cassava Peelings on Bioethanol Yield. American Journal of Environmental Engineering, Vol.7, No.3, pp 58-64
- Michael N. Worfa, Samson P. Salifu, **Benjamin Afotey**, Moses Mensah (2017): Comparative Study on Fungal Pretreatment and Hydrolysis of Cassava Peelings and Rice Husks for Second-Generation Bioethanol Production. American Journal of Biochemistry, Vol.7, No.2, pp 27-36
- **Benjamin Afotey**, Melanie Sattler, Stephen P. Mattingly, Victoria Chen (2013): Statistical Model for Estimating Carbon Dioxide Emissions from a Light -Duty Gasoline Vehicle. Journal of Environmental Protection, Vol. 4, No. 8A, pp 8-15.
- Annabrabha Athappan, Sulak Sumitsawan, Roja Haritha Gangupomu, Ketwalee Kositkanawuth, Parthen Parikh, **Benjamin Afotey**, Neelesh Sule, Sahithi Raj Kalidindi, Melanie L. Sattler, Yvette Pearson Weatherton (2013): Volatile Organic Compound Emissions from Surface Coating Facilities: Characterization of Facilities, Estimation of Emission Rates, and Dispersion Modeling of Off-Site Impacts. **Journal of Environmental Protection**, Vol.4, No. 8A1, pp123-141.
- **Conference Papers & Report**
Sattler, Melanie; Jangikhatoonabad, Neda; **Afotey, Benjamin**; Hossain, M. Sahadat. "Evaluation of Landfill Gas Recovery System: Case Study for a Ghana Landfill." Extended

- Stephen Mattingly, Victoria C.P. Chen, Brian H. Dennis, J.K. Rogers, Melanie L. Sattler, Yvette Pearson Weatherton, **Benjamin Afotey** (2012): A Multi-Disciplinary Sustainable Senior Design Project: Design of a Campus Biodiesel Refinery. American Society for Engineering Education Journal (ASEE), AC 2012-4108, Annual Conference & Exposition Papers.
- Annabrabha Athappan, Sulak Sumitsawan, Roja Haritha Gangupomu, Ketwalee Kositkanawuth, Parthen Parikh, **Benjamin Afotey**, Neelesh Sule, Sahithi Raj Kalidindi, Melanie L. Sattler, Yvette Pearson Weatherton. "Emissions of Volatile Organic Compounds from Surface Coating Facilities". Proceedings of the Air & Waste Management Association 107th Annual Conference. Los Angeles, California, June 2014.
- Sattler, Melanie; Alavi, Kambiz; Chen, Victoria; Mattingly, Stephen; Rogers, Jamie; Weatherton, Yvette; **Afotey, Benjamin**; Rani, Madhu; "Engineering Sustainable Engineers" International Symposium on Sustainable Systems and Technology Co-organized with the IEEE Society on Social Implications of Technology, Washington D.C., May 2010
- **Afotey, Benjamin**; Sattler, Melanie; Mattingly, Stephen P.; Chen, Victoria. "Statistical Approach to the Development of a Microscale Model for Estimating Carbon Dioxide Emissions from Light Duty Gasoline Vehicle." Proceedings of the Air & Waste Management Association 103rd Annual Conference, June 2010.
- **Afotey, Benjamin**; Sattler, Melanie L.; Mattingly, Stephen P. "Statistical Approach to the Development of a Microscale Model for Estimating Exhaust Emissions of a Light Duty Gasoline Vehicle." Proceedings of the Air & Waste Management Association 101st Annual Conference, June 2008.
- Final Report: Feasibility Studies and Training to Support Landfill Gas Recovery in Ghana. Report for US Environmental Protection Agency, EPA GMI Cooperative Agreement XA-83539401-0. Sahadat Hossain, Melanie Sattler, Nada Jangikhatoonnabad, **Benjamin Afotey**, December 2014.

Department Projects Supervised

- Postgraduate Thesis
 1. Methane generation potential and energy production benefits of landfills in Ghana (Student supervised: Nene Amoateng)
 2. Comparative Analysis of Selected Octane Enhancing Fuel Additives as Substitute to Methylcyclopentadienyl Manganese Tricarbonyl (MMT) (Student supervised: Baba Akaribo)
 3. Effects of Ethyl Tertiary Butyl Ether (ETBE) and Methyl Tertiary Butyl Ether (MTBE) on Gasoline Properties (Student supervised: Theophilus Shiako)
- Undergraduate Projects
 1. Production of essential oil from local raw materials (orange peels) using steam distillation.

2. Biofuel production from plastic waste.
3. Biochar production from cocoa pod husk and coconut husk feed stocks.

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4. Assessment of Cement Dust Deposits at Tema Cement Factory, Ghana.
5. Estimation of generated amount of E-waste and its disposal in Ghana.
6. Plant design for the production of pellets for the sandals factory from plastic waste
7. Plant design for the production of acetylene from petroleum feed stock
8. Plant Design for the production of acetylene from calcium carbide

Consulting Work/Research Project/Engineering Practice

Jan. 2013 – Dec. 2014

Conducted feasibility studies to support landfill gas recovery at Tema Kpong landfill site and Tamale landfill site. I was the primary investigator in Ghana and the project was funded by U.S. EPA.

Post-doctoral Fellow, University of Texas, Arlington

May 09 – Nov 10

As a post-doc, I have had several opportunities to demonstrate and develop my teaching skills:

- Last summer, as part of a National Science Foundation Sponsored Research Experience for Teachers, I spent five weeks helping to train three high school math and science teachers how to use dispersion modeling software.
- During spring semester, I served as an advisor to an undergraduate group of environmental engineering students designing a biodiesel refinery for the UT Arlington Campus.
- I conducted several Civil Engineering presentations at UT Arlington's Engineering Saturday, which introduces junior high and high school students to careers in engineering.
- During fall 2009, I served as a tutor for students in math and science at Martin High School for around 15 hours a week. As part of my post-doc, I had the opportunity to work on a variety of projects that enhanced my background in Environmental Engineering including:
- A project sponsored by the Texas Commission on Environmental Quality, for which I collected data from state permit applications and conducted dispersion modeling, and
- "Engineering Sustainable Engineers," a project sponsored by National Science Foundation for which I did the web page design, and also learned instructional software WebCT.

Environmental Compliance Investigator, TCEQ

July 07-Dec. 08

Duties involved conduction of compliance investigations. These investigations included emissions event investigations and Title V Compliance Investigations (SPCI, OPCC, semi-annual deviation and annual compliance certification). The process includes a review of Title V permits, NSR permits and record keeping and requirements documents of regulated entities. Further duties included completion of Title V, emissions event and request for comments (RFC) reports.

At TCEQ, I improved my knowledge by taking courses which include; Process Technology Equipment, Process Technology Systems, Chemistry for Environmental Professionals, Inspection of Gas Control Devices and Selected Industries, Area Source MACT and CARB 100 Series.

Student Employee, University of Texas, Arlington

Aug. 05 – May 07

Duties involved intensive data collection and analysis using on-board analyzers (MEXA 720 & MEXA -1170 HNDIR) for vehicle emissions measurement to determine the impact of a pre-combustion retrofit device and a fuel additive (Ethos) on vehicle emissions. Research was funded by the North Central Texas Council of Governments.

Industrial Research Assistant, Eastern Research Group, Inc., Austin TX Jan. 05 – Aug. 05
Duties involved data collection on diesel construction equipment types using time-lapse photography in the Dallas/Fort-Worth ozone non-attainment area, field interviews and report writing.
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Graduate Teaching Assistant, University of Texas, Arlington Jan. 03 – Jan. 04
Helped conduct and grade Civil Engineering undergraduate fluid laboratory experiments.

CONTINUOUS PROFESSIONAL DEVELOPMENT

1. Relief & Flare Systems **June 01-05, 2015**
Organized by Petro skills, Aberdeen United Kingdom

2. Green Gas Study Tour: Biogas & Landfill Gas Facilities **October 17-21, 2011**
Organized by EnD - I Ag, Cologne & Berlin, Germany

EDUCATION

- **PhD. Civil & Environmental Eng. (Major–Environmental Eng.) December 2008**
University of Texas at Arlington, Arlington TX Cumulative GPA: 3.78/4.0
Research Topic: Statistical approach to the development of a micro scale emission model for estimating emissions from a light duty gasoline vehicle. Research involves second-by-second vehicle activity and engine parameter data collection using on-road analyzers (MEXA 720 & MEXA 1170 HNDIR) installed in the light duty gasoline vehicle. (Advisor: Dr. Melanie Sattler)
- **Master of Engineering, Civil & Environmental Eng. December 2003**
University of Texas at Arlington, Arlington TX
- **Bachelor of Science, Chemical Engineering, June 2000**
University of Science and Technology, Kumasi, Ghana

RELEVANT COURSEWORK

Air Pollution Dispersion Modeling, Air Pollution Chemistry & Meteorology, Air Pollution Control, Transportation & Air Quality, Environmental Permitting, Environmental Risk Based Corrective Action, Solid Waste Management, Wastewater Treatment Plant Design, Biological

Processes, Physical Chemical Processes-I, Water Resources Planning, Surface Water Hydrology, Geographic Information System (GIS), Intermediate GIS, Traffic Flow theory, Transportation Engineering, Infrastructure Design, Advanced Engineering Statistics, Design of Experiments, Multivariate Statistics for Data Mining.

COURSE WORK PROJECTS

- Developed nitrogen oxides emission model using least square regression approach.
- Modeled odor emissions from a wastewater treatment plant using ISC–AERMOD View and recommended control strategies.
- Modeled CO, HC, VOC emissions from Cooper Street using Mobile6 and CALRoads View (roadway dispersion modeling software) and recommended control strategies.
- Designed a wastewater treatment plant for an inflow of 28 MGD.
- Designed an incinerator as an air pollution control technology, primarily for VOC removal.
- Completed a project on categorical exclusion, an environmental review action.
- Used GIS software to locate non-attainment counties for ozone in Dallas/ Fort Worth

region.

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PROFESSIONAL AFILIATIONS

- **Member of Ghana Institution of Engineering** (July 2015 – Current)
- **Member of Air & Waste Management Association** (Jan. 2005 – Current)
- **Member of The Energy Center** (Nov. 2010 - Current)
Kwame Nkrumah University of Science and Technology
- **Vice President of Air & Waste Management Association's Student Chapter at UTA**
(Jan. 2005 – May 2007)
- **Member of American Society of Civil Engineers** (June 2003 – Current)
- **Member of National Society of Black Engineers** (June 2003 – Current).
- **Member of Chi Epsilon, National Civil Engineering Honor Society**
University of Texas at Arlington Chapter

HONOURS

- **Doctorial Stem Fellowship** (August 2005 – December 2007)
University of Texas at Arlington Doctorial Stem Fellowship

SKILLS/SOFTWARE

- Air Quality Software: ISC–AERMOD View & CALRoads View (Lakes Environmental software), Mobile6.
- Statistical software: Statistical Analysis System (SAS).
- Matlab
- GIS software: Arc View, Arc Info.
- Computer Skills: Windows OS, Microsoft Office.
- Well – versed with the concept of dispersion modeling.
- Intensive experience with on-road data collection.
- Hands on data analysis using MS-EXCEL spreadsheet.
- Excellent communication and writing skills.
- Strong math and chemistry background.
- In-depth knowledge of State and Federal regulations.
- Ability to work on a team.