

TEJASVI SHARMA, PhD, MBA

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Curriculum Vitae

EDUCATION

Ph.D., Mechanical Engineering, Alternative Energy, University of Iowa – Iowa City, IA May 2019
Dissertation: *Biochar and Other Properties Resulting from the Gasification of Biomass with Different Components.*

MBA, University of Iowa – Iowa City, IA May 2019
Graduate Certificate in Business Analytics Summer 2016

MS, Mechanical Engineering, University of Iowa – Iowa City, IA May 2015

BSE, Mechanical Engineering, University of Iowa – Iowa City, IA December 2013
Minor in Mathematics

Executive Education:

Climate Change & Energy: Policymaking for the long term, Harvard Kennedy School– Cambridge, MA 2018

Certifications:

Negotiation & Leadership, Harvard Law School– Cambridge, MA 2019

Leadership Communications, Harvard University – Cambridge, MA 2016

Managing Yourself & Leading Others, Harvard University – Cambridge, MA 2016

TEACHING EXPERIENCE

MAHARISHI INTERNATIONAL UNIVERSITY – FAIRFIELD, IA Feb 2019 to Present

Assistant Professor

Dual faculty appointments to the sustainability unit, comprising the Business Administration Department and Sustainable Living Department.

Notable Achievements:

- Develops content and teaches interdisciplinary energy courses on different energy technologies, including: Thermal Power Utilities and Efficiency; Fundamentals of Wind Turbines; Global Sustainability; Survey of Green Technologies, Global Sustainability, Energy and Environment, Energy Systems for the Department of Sustainability; Sustainable Technologies for the Full-time and Professional Sustainable MBA program.
- Co-developing new energy curriculum for the Department of Sustainable Living—in close collaboration with the department Chair and the Vice President of Academic Affairs—encompassing creating courses that include intense learning activities, hands-on projects, and on-site learning at power plants and wind turbine locations.
- Connects students to community projects that involve concepts taught in class.
- Augments the student learning experience by securing guest industry speakers and organizing classroom panels, facilitating student learning from each other's perspectives and insights.
- Mentors students, focusing on increasing collaboration with industry partners as an internship faculty advisor.

UNIVERSITY OF IOWA – IOWA CITY, IA 2013 to 2017

Teaching Assistant, Capstone Design | Fall & Spring 2014 to 2017

Provided key assistance to capstone design of innovative Mechanical Engineering and Industrial Engineering solution projects for companies, hospitals, non-profit organizations—focusing on execution and putting projects into service.

Notable Achievements:

- Liaised among professor, students, and engineering companies to facilitate design projects, including conducting regular meetings with students as project supervisor, travelling to companies, building trusted relationships with organizations, ensuring project completion, and securing future project opportunities.
- Coordinated projects with student teams in the design of projects from sponsors, such as John Deere, Rockwell Collins, HNI, University of Iowa School of Medicine, and Iowa Power Plant.
- Mentored students throughout project duration on technical and professional project elements, such as communication styles and project management, to ensure successful and timely completion.

Teaching Assistant, Laboratory Courses | Spring & Fall 2015, Spring 2016

Assisted in delivering instruction for approximately 95 students for **Experimental Engineering & Engineering Instrumentation**, as part of a 3-member Teaching Assistant team.

Notable Achievements:

- Chosen by professor to manage, operate, troubleshoot, and train undergraduates on 12 pieces of engineering laboratory equipment, including cooling tower/heat exchanger, wind tunnel, compressed air turbine, and dynamic response of mass spring system.
- Managed execution of lab experiments, including designing experiments, training senior students on procedures, overseeing project execution, reviewing data for accuracy, and collaborating with students on interpreting data and calculating experimental uncertainty.
- Headed 2 laboratory sections with an average of 27 students per section, including grading and meeting with students (often outside office hours) to ensure final projects were completed on time.

Teaching Assistant, Theoretical Core Courses | Summer & Fall 2014; Summers 2013, 2017, 2018

Served as Lead Teaching Assistant for **Thermodynamics 1 and Thermodynamics 2**, with both classroom and online components, including grading, setting up lectures, delivering guest lectures, and providing office hours. Assisted students in executing projects, as well as writing and grading midterms and final exams.

Notable Achievements:

- Assisted in transitioning 100-person on-site class to online format; developed methods that successfully engaged students and facilitated virtual discussions.
- Planned and managed course content; organized, supervised, and provided other teaching assistants with guidance.

RESEARCH EXPERIENCE

UNIVERSITY OF IOWA, DEPARTMENT OF MECHANICAL ENGINEERING – IOWA CITY, IA

May 2019 to Present

Postdoctoral Research Scientist

Cleanly burning fuels and characterizing the resulting biochar from gasification of different biomasses using a single stage downdraft gasifier of corn, soybeans, wood, and refuse-derived fuel pellets as primary feedstock. Performed testing and analysis of mineral content and distribution.

Notable Achievements:

- Ph.D. researcher selected to work on project for \$250K+ pilot scale system involving examination of resulting biochar, which can be used as a soil amendment and for water filter purposes.
- Oversees an undergraduate student, while conducting analyses that include examining the surface area and porosities of char from blends from biomass and refuse-derived fuel (plastic, cardboard, and paper).

OAKDALE POWER PLANT/UNIVERSITY OF IOWA – CORALVILLE, IA

Jan 2012 to May 2019

Biomass Gasification & Combustion Research

Conducted research on a pilot scale gasifier producer, focusing on converting biomass waste into electricity; engaged with clients, collaborated with engineers, and operated a gasifier that consumed 250 lbs. of biomass hourly.

- Conducted extensive research, including:

- Studied the energy production from a single-stage and double stage downdraft gasifier.
- Examined in-bed combustion process of fuels under different parameters, such as equivalence ratio, temperature, and thermal equilibrium height; evaluated outcomes of biomass content on syngas (CO, CO₂, CH₄), biochar, and tar.
- Researched combustion and gasification of different biomasses (woodchips, *Miscanthus*, and refuse-derived waste), fuel blends, and the resulting effects on energy production, biochar, and heat components.
- Studied the gasification system with *in situ* clean-up energy production from biomasses—focusing on the effects of cellulose, lignocellulose, and lignin content impact on syngas production.

- Performed broad analyses, including:

- Investigated how to best optimize gasification operating properties to increase the surface area of biochar and its effectiveness in increasing soil fertility.
- Analyzed and studied the properties and characteristics of biochar products that resulted from gasification of different biomasses.
- Analyzed the formation and spread of chemical elements (metal and non-metal) as nodules in the biochar resulting from the process of gasification.

Notable Achievements:

- Research findings led to publication of 9 papers, including: 5 conference papers, 3 co-authored journal papers, 1 primary-author journal paper, and another one in preparation.
- Co-designed system to identify syngas (CO, CO₂, CH₄) using chromatography machine; collaborated with plant managers and gasifier designers to optimize syngas and biochar production—ensuring clear communications with power plant personnel with safety as the top priority.
- Assisted in writing \$1.15M Department of Energy grant proposal in collaboration with advisor and faculty members at the University of Alabama, including writing and revising drafts; collaborating with faculty members from Alabama; coordinating communications and ensuring all project members were on the same page; and collaborating with the Director of Grants Support, ensuring all documentation requirements were on track.
- Facilitated \$38K project between the University of Iowa and NexCrude, including initiating project from connecting industry contact with U. Iowa advisor.
- Assisted a startup company in Iowa using University of Iowa-developed technology, and offered technical advising on converting waste, plastic, and tires into useful energy.
- Attended numerous conferences and presented research findings, such as the American Society of Automotive Engineers (ASME) and the Combustion Institute Symposium (full conferences list later in CV).
- Mentored and collaborated with 6-10 students, averaging 2 undergraduate students each summer throughout 7-year tenure.

UNIVERSITY OF BRAZIL/UNIVERSITY OF IOWA – ITAJUBA, BRAZIL

Aug 2015

Miscanthus Gasification Research

Conducted gasification research focused on converting biomass waste to electricity, in collaboration with engineers, gasification experts, and Federal University of Brazil, Itajuba (UNIFEI) faculty. Analyzed a 2-stage downdraft gasification process of *Miscanthus*, wood, and corn fuel; researched and analyzed the effects of biomass properties and equivalent ratio effects on syngas, biochar, and tar.

Notable Achievements:

- Finding led to 3 conference papers and a published journal paper as primary author resulting from collaboration with 3 Ph.D. students from the University of Brazil and the University of Iowa.
- Facilitated a biomass gasification and energy conversion project by obtaining the Stanley International Research Grant (please see Recognition & Awards), including close collaboration with a research faculty member and Ph.D. students.

ALL POWER LABS – BERKELEY, CA

June 2015 to July 2015

Business Development & Mechanical Engineering

Served as a full-time business strategist and hands-on engineer for a 30-person biomass gasifier manufacturer that sought to expand its presence beyond Benin, Haiti, and Liberia.

Notable Achievements:

- Significantly increased demand for gasifier product—to the point of surpassing production capacity—and secured initial interests with five new investors.
 - Partnered with senior leadership to acquire accounts in 3 main sectors (Energy, Agriculture, and Higher Education) by developing marketing campaign strategies, including targeted collateral.
 - Designed go-to-market strategy and secured exclusive distributor agreements to penetrate Nigeria, Sierra Leone, and other African regions eligible for government energy grants, including analyzing customer current energy expenses.
- Assisted in modifying a 20KW gasifier product and contributed to developing an advanced filter test.
 - Conducted different tar tests and analyzed filtration system in Power Pallet and Power Cube.
 - Generated strategic product development recommendations to the CEO, including integrating a backup battery to supplement the 12-hour charge period.

Research Supervisor, Department of Mechanical & Industrial Engineering – Iowa City, IA | Summers 2013, 2014, 2016, 2017, 2018

Supervised and mentored in-state and out-of-state graduate, undergraduate, and high school students.

Notable Achievements:

- Mentored engineering students, including oversight of more than 6 interns in the IOWA-EPSCoR Program—a federal initiative that stimulated competitive U.S.-based research.

Independent Research, Solar Cooker Project – Cameroon, Africa | Winter 2013

Researched, developed, and oversaw the construction of solar cooker prototypes.

Notable Achievements:

- Conceptualized, designed, and supervised carpenters in the building of 3 solar cooker prototypes, delivering technology to residents in rural African villages that empowered them with the ability to cook food using the sun.
- Honored with formal appreciation from the Prime Minister (now the Grand Chancellor) of Cameroon.

Capstone Class, University of Iowa Power Plant, Program for Enhanced Design Experience – Iowa City, IA | Aug 2012 to May 2013

Headed a team of 5 undergrad students in designing a biomass fuel yard, including predicting return on investment (ROI) as well as fiscal and environmental impact estimations for the University of Iowa.

Notable Achievements:

- Studied and analyzed the use of different biomasses—facilitating elimination of coal as a fuel—at the University of Iowa Power Plant as part of its initiative to become 40% renewable, focusing on using biomass as fuel; designed a site layout that addressed how the fuel would be stored and processed on-site.
- Final delivery resulted in a fuel yard design layout, presentation and report, including all constraints involving various types of biomass such as wood, sawdust, and oat hulls.

RECOGNITION & AWARDS

Certificate of Recognition by the Board of Regents, as President of the Graduate & Professional Student Government, for service to the University of Iowa and the Board of Regents, April 12, 2018.

Stanley Grant Award for International Research, University of Iowa, March 10, 2015.

JOURNAL PUBLICATIONS

Sharma, T., & Ratner, A. (2021). Analysis and Characterization of Metallic Nodules on Biochar from Single-Stage Downdraft Gasification. *Processes*, 9(3), 533.

Zang, G., Jia, J., Shi, Y., **Sharma, T.**, & Ratner, A. (2019). Modeling and economic analysis of waste tire gasification in fluidized and fixed bed gasifiers. *Waste Management*, 89, 201-211.

Sharma, T., Maya, Y., Diego, M., Nascimento, M., Regis, F., Shi, Y., Ratner, A., Lora, S., Electo, E., Mendes Neto, L.J. & Escobar Palacios, J.C., (2018). An Experimental and Theoretical Study of the Gasification of *Miscanthus* Briquettes in a Double-Stage Downdraft Gasifier: Syngas, Tar, and Biochar Characterization. *Energies*, 11(11), p.3225.

Zang, G., **Sharma, T.**, Ratner, A., & Lora, E. S. (2018). A comparative study of biomass integrated gasification combined cycle power systems: Performance analysis. *Bioresource Technology*, 255, 246-256.

Zang, G., Jia, J., **Sharma, T.**, Ratner, A., & Lora, E. S. (2018). Techno-economic comparative analysis of Biomass Integrated Gasification Combined Cycles with and without CO₂ capture. *International Journal of Greenhouse Gas Control*, 78, 73-84.

Yamashita, H., Hart, R., **Sharma, T.**, Samanta, A., Wang, Q., & Xiao, S. (2016). A review of multiscale methods and their applications in modeling and simulation of engineering problems. *Int. J. Recent Technol. Mech. Electr. Eng.*, 3, 42-47.

Nascimento, M., Maya, M., Ratner, A., Silva Lora, E.E., Mendes Neto, L.J., Escobar Palacios, J.C., Vieira Andrade, R., **Sharma, T.** (2020) Modeling and validation of air-steam-oxygen gasification considering steam enthalpy (in review).

Sharma, T. & Ratner, A. Effects of biomass and RDF feedstock on performance characteristics on resulting biochar (in preparation).

Nascimento, M., Regis, F., Gonzalez, M., Ratner, A., Lora, S., Electo, E., Mendes Neto, L.J., Escobar Palacios, J.C., Vieira Andrade, R., **Sharma, T.** & Shi, Y. Review of bubbling fluidized bed gasifier (In preparation).

PEER REVIEWED ARTICLES IN CONFERENCE PROCEEDINGS

Shi, Y., Yepes, D., Nascimento, R., **Sharma, T.**, Ratner, A., & Lora, E. S. (2018, November). Thermodynamic Equilibrium Model for Waste Gasification. In *ASME 2018 International Mechanical Engineering Congress and Exposition (IMECE2018-88010)*. American Society of Mechanical Engineers.

Sharma, T., Yepes, D., Shi, Y., Zang G, Ratner, A., & Lora, E. S. *Miscanthus* Gasification in a Downdraft Gasifier, *10th. U.S. National Combustion meeting*, Maryland, MD, April 23-26, 2017

Sharma, T., Yepes, D., Shi, Y., Ratner, A., & Lora, E. S. (2016, November). Steam Gasification of *Miscanthus* in a Double Stage Downdraft Gasifier. In *ASME 2016 International Mechanical Engineering Congress and Exposition* (pp. V06AT08A012-V06AT08A012). American Society of Mechanical Engineers.

Sharma, T., Shi, Y., Zang, G., & Ratner, A. (2015, November). Analysis and Comparison of Biochar from a Pilot Scale Downdraft Gasifier. In *ASME 2015 International Mechanical Engineering Congress and Exposition (IMECE2015-52444)*. American Society of Mechanical Engineers.

Shi, Y., **Sharma, T.**, Zang, G., & Ratner, A. (2014, November). Biomass Gasification in a Pilot-Scale Gasifier. In *ASME 2014 International Mechanical Engineering Congress and Exposition* (pp. V06AT07A073-V06AT07A073). American Society of Mechanical Engineers.

Shi, Y., **Sharma, T.**, & Ratner, A. (2013, November). Characterization of Real Time Producer Gas Generation from Paper Sludge Gasification. In *ASME 2013 International Mechanical Engineering Congress and Exposition* (pp. V06AT07A007-V06AT07A007). American Society of Mechanical Engineers.

Shi, Y., Osgood, E., **Sharma, T.**, & Ratner, A. Biomass Pyrolysis and Gasification of Varying Equivalence Ratio in a Lab Scale Updraft Gasifier, *8th National US Combustion Meeting*, Park City, UT, May 19-22, 2013.

Osgood, E., Shi, Y., **Sharma, T.**, & Ratner, A. Biomass Pyrolysis and Gasification of Different Biomass Fuels, *8th National US Combustion Meeting*, Park City, UT, May 19-22, 2013.

Sharma, T., Shi, Y., Osgood, E., & Ratner, A. Pyrolysis and Gasification of Paper Sludge, *8th National US Combustion Meeting*, Park City, UT, May 19-22, 2013.

PRESENTATIONS & CONFERENCES

Invited Participant, United Nations sustainable development goals academic expert group round table (**SDG-7**), Rutgers University, NJ, Sep 2019.

Invited Research Presentation, "Biochar and Other Properties Resulting from the Gasification of Biomass," Department of Engineering, Wake Forest University, Winston Salem, NC, April 2019.

Presentation, "Biochar Analysis from Biomass Gasification," Combustion Institute Conference to Alternative Fuels track, Minneapolis, MN, May 2018.

Participant, "MIT Energy Conference: Transformational Technologies," MIT, Boston, MA, February 2018.

Presentation, "*Miscanthus* Gasification in a Downdraft Gasifier," 10th US National Combustion meeting to Alternative Fuels Track, College Park, MD, April 2017.

Invited Speaker, STEM lecturer series, Southeast Junior High School, Iowa City, IA, February 2016.

Participant, "The 19th Annual Africa Business Conference," Harvard Business School, Boston, MA, February 2016.

Presentation, "Steam Gasification of *Miscanthus* in a Double Stage Downdraft Gasifier," IMECE ASME Conference to Energy track, Phoenix, AZ, November 2016.

Participant, "The 18th Annual Africa Business Conference," Harvard Business School, Boston, MA, February 2016.

Presentation, "Analysis and Comparison of Biochar from a Pilot Scale Downdraft Gasifier," IMECE ASME Conference to Energy track, Houston, TX, November 2015.

Co-presenter, "Laser & Flames," 2015 STEM Institute for Young Scientists, Iowa City, IA, November 2015.

Invited Participant, "Africa Business Practicum," YALE School of Management, New Haven, CT, November 7, 2015.

Participant, "Energy Africa 9th Annual Conference," Colorado School of Mines, Golden, CO, October 2015.

Participant, "Oxford Africa Business Conference," Said Business School, University of Oxford, United Kingdom, May 2015.

Invited Participant, "2015 KPMG Global Energy Conference," Houston, TX, May 2015.

Poster Presentation, "Characterization of Biochar from a Pilot Scale Downdraft Gasifier," US Combustion Institute 9th Annual Meeting, Cincinnati, OH, May 2015.

Participant, "The 17th Annual Africa Business Conference," Harvard Business School, Boston, MA, February 2015.

Poster Presentation, "Redesign of a Lab-Scale Gasification System," Iowa EPSCoR, Iowa State University, Ames, Iowa, July 22, 2014.

Presentation, "Parametric Study of Biomass Gasification in a Pilot Scale Gasifier," Iowa Academy of Science, Cedar Falls, IA April 12, 2014.

Presentation, "Pyrolysis and Gasification of Paper Sludge," 8th National US Combustion Meeting, Park City, UT, May 19-22, 2013.

PROFESSIONAL SERVICE

Reviewer , International Journal of Energy Research	2020
Editorial Board Member , Journal of Material Science & Technology Research	2019
Reviewer , Environmental Science & Pollution Research journal, Springer Nature	2019
Reviewer , Catalysis journal, MDPI	2018
Reviewer , 3 rd International Energy Engineering & Environment Protection Conference (EEEP)	2018

ACADEMIC SERVICE

UNIVERSITY OF IOWA:

President, Graduate & Professional Student Government (GPSG) May 2017 to May 2018

- Represented and advocated on behalf of 8K+ graduate and professional student body to campus administration, the University of Iowa President, the board of regents, Iowa general assembly and the Governor of Iowa—including collaborating closely with senior faculty, administration, staff and undergraduate students on campus-wide initiatives.
 - Advocated on behalf of students on federal policy issues in Washington, D.C. to members of Congress and their staff, including Senator Joni Ernst, as well as for a permanent graduate/professional liaison on the city council of Iowa City.
 - Met regularly with government officers (President/Vice President/cabinet) from the Colleges of Medicine, Law, Pharmacy and Business Administration, and the Graduate College on initiatives such as mental health, events for first generation graduate students and interdisciplinary professional events.
 - Planned, arranged and chaired meetings with council members
 - Delivered speeches to the public
 - Initiated and supported community and fundraising events, in collaboration with constituents.
 - Served on numerous committees (see Academic Committee Service) and executive searches, including collaborating closely with Faculty Senate President and VP, staff council, and undergraduate student government on a range of issues.

Graduate Senator, Department of Mechanical & Industrial Engineering Mar 2016 to May 2017

Government Relations Member, Graduate & Professional Student Government (GPSG) May 2016 to May 2017

President, Student International Meditation Society (SIMS) Aug 2015 to May 2016

ACADEMIC COMMITTEE SERVICE

UNIVERSITY OF IOWA:

Member, Vice President for Research Search Committee	Jan 2018 to Mar 2019
Member, Dean of Students Search Committee	Jan 2018 to May 2018
Member, Co-Curricular Transcript Advisory Committee	Jan 2018 to May 2018
Member, Alumni Leadership Council (Ex-officio)	Jan 2018 to May 2018
Member, Finkbine Awards Committee	Jan 2018 to May 2018
Member, Legislative Council	Jan 2018 to May 2018
Member, Central Advisory Committee: Division of Student Life	March 2018 to May 2018
Member, Brand Development Council	Nov 2017 to May 2018
Member, Student Activity Fee Committee	Aug 2017 to May 2018
Member, Graduate Student Employee Committee	Aug 2017 to May 2018
Member, Path Forward Steering Committee	May 2017 to May 2018

Member, Shared Governance Coordinating Committee on Inclusion & Campus Climate
Member, External Relations Council
Member, Shared Governance Council

May 2017 to May 2018
May 2017 to May 2018
Aug 2018 to May 2018

SKILLS & LANGUAGES

SOFTWARE: Microsoft Office, including advanced Excel; AutoCAD; Pro Engineer; Ansys; Mathematica; C; Corel Draw; MATLAB; Labview; JMP; Zoho; R; and SQL.

LANGUAGES: Fluent in French & English; basic understanding of spoken Hindi.

PROFESSIONAL AFFILIATIONS

Member, American Society of Mechanical Engineers (ASME)

May 2018 to Present