

UMAKANTA JENA, PhD

Renewable Energy Center, Division of Atmospheric Sciences
Desert Research Institute, Reno, Nevada, 89512
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EDUCATION

The University of Georgia, Athens, GA

May 2011, Ph.D., Biological and Agricultural Engineering

Dissertation: "Thermochemical conversion of microalgal biomass for production of biofuels and co-products"
(Advisor: Prof. K. C. Das).

Indian Institute of Technology, Kharagpur, India

January 2003, M.Tech., Agricultural Engineering

Thesis: "Design, development and testing of a gas cleaning system for a 20 kW_e biomass gasifier based engine system" (Advisor: Prof. E. V. Thomas).

Orissa University of Agriculture and Technology, Bhubaneswar, India

June 2001, B.Tech., Agricultural Engineering

PROFESSIONAL EXPERIENCE

Desert Research Institute, Reno, Nevada

September 2012-present, Nell J. Redfield Foundation Fellow- Renewable Energy, Renewable Energy Center, and Division of Atmospheric Sciences (*Supervisor: Dr. S.Kent Hoekman*)

Responsibilities: Development of research grants, research collaborations, and conducting research on hydrothermal conversion of biomass to solid fuels and value added products. Additional responsibilities include, designing experiments, writing reports, publications, presentations and student supervision.

Research Projects

- Hydrothermal carbonization of lignocellulosic and algae biomass.
- Optimization of operating parameters of biomass process development unit.
- Evaluation of pelletization of hydrochar from hydrothermal carbonization process

The University of Georgia (UGA), Athens, GA

May 2011- September 2012, Post-doctoral Research Associate, Biorefining & Carbon Cycling Program, College of Engineering (*Supervisor: Prof. K.C. Das*)

Responsibilities: Conducted research on thermochemical processes for conversion of biomass to bio-oil and value added products and bio-oil upgrading. Additional responsibilities included writing research grants, reports, publications, presentations and supervision and training of personnel.

Research Projects

- Catalytic hydrogenation of fast pyrolysis bio-oil and aqueous phase fractions.
- Macroalgae biofuel production via thermochemical liquefaction and demineralization, Co-solvent liquefaction,
- Upgrading and combustion of algal bio-oil.
- Alternative use of red mud as a thermochemical catalyst for biofuel production.

August 2006-May 2011, Research and Teaching Assistant, Biological & Agricultural Engineering Department (*Supervisor: Prof. K.C. Das*)

Responsibilities: Developed laboratory infrastructure for the high pressure reaction system for hydrothermal conversion of algae and wet biomass feedstocks, evaluated and optimized the process operating conditions including development of experimental setups, frequent interfacing with equipment vendors and procurement of materials and writing results and research papers.

R& D Projects

- Development of technologies for hydrothermal liquefaction of microalgae.
- Influence of low cost catalysts on pyrolysis and combustion of biomass feed stocks.
- Effect of hydrolytic pretreatment of paper mill sludge on production of biofuels.
- Liquefaction of Asian clam for biofuel production.
- Microalgae Batch cultivation and growth study of microalgae using recovered aqueous phase.

Supervising/ Mentoring

Co-mentored senior level visiting interns (Biochemical Engineering) from the Universidad Autonoma de Coahuila, Mexico, trained them on laboratory protocols, and guided in experimental evaluation.

2008-2011, Teaching Assistant, Biological and Agricultural Engineering Department, UGA

Physical Unit Operations, ENGR 3540

Environmental Engineering-I, ENGR 4440/6440

Sardar Patel Renewable Energy Research Institute (SPRERI), Vallabh Vidyanagar, Gujarat, India

June 2005-July 2006, Scientific Officer

Sept 2003-May 2005, Research Scientist

Responsibilities: Oversaw R & D projects on conversion of wood and agricultural residues into syngas, developed fuel gas burners, developed uses of syngas in diesel engine, training of researchers, supervising student interns, wrote grant proposals for research funding and project reports on results of the work, involved in outreach and extension activities.

R & D Projects

- Development and field evaluation of a 100 kg/h agro-residue based gasification system.
- Development and evaluation of producer gas (syngas) burners for chicory roasting.
- Development and testing of a sand preheating unit for thermal application of syngas.
- Development and evaluation of bio-organic filter for producer gas conditioning and evaluation of 375 kg/h SPRERI's modular gasification system.
- Operational Research Projects of 60 kg/h TNAU gasifier for jaggery heating applications
- Optimization of operational conditions of preheating and briquetting of biomass for gasification.

Technology Transfer & Public Outreach

- SPRERI's open core gasification technology (50-100 kg/h capacity) to M/s Abhay Engineers, Mangalore, India (A cashew processing industry).
- Field installation and testing of SPRERI's 50 kg/h open core gasifier for community cooking in Kamrej Hindu Temple, Surat, India.
- Field installation, testing and demonstration of 100 kg/h downdraft gasifier system in Vimsons Chicory Corp., Anand, India (<http://www.vimsonschicory.com/index.htm>).
- Development of a 2 kg/h prototype gasifier unit for extension education and training.

Supervising/ Mentoring

- Co-mentored undergraduate senior students of Chemical Engineering. Trained and guided students on evaluation of gasification systems and guiding in their experimental work and analysis.

The Energy and Resources Institute (TERI), New Delhi, India

May-Dec. 2002, Research Intern in Biomass Energy Technology Applications

- Development and evaluation of cyclone separator as primary syngas cleaning and cooling units for a 20 kW_e engine generator set.
- Development of heat exchangers as air preheating unit for 20kg/h downdraft gasifier system.
- Training on installation of biomass gasification systems.

Indian Institute of Technology, Kharagpur, India

July 2001-Dec 2002, Graduate Student, Institute Fellow, Depart. of Agri. & Food Engineering

Received training on design and testing of agricultural equipment, pumps, engines, farm tractors and alternative energy technologies.

PUBLICATIONS

Journal Articles

1. **Jena, U.**, K.C. Das and J.R. Kastner. 2012. Comparison of the effects of Na_2CO_3 , $\text{Ca}_3(\text{PO}_4)_2$, and NiO catalysts on the thermochemical liquefaction of microalga *Spirulina Platensis*. *Applied Energy*, 98(2012): 368-375.
2. N. S. Bolan, R. Thangarajan, B. Seshadri, **U. Jena**, K.C. Das, H. Wang and R. Naidu. 2012. Landfills as a biorefinery to produce biomass and capture biogas. *Bioresource Technology* (**In Press**, Accepted on 6 September 2012).
3. **Jena, U.** and K.C. Das. 2011. Comparative evaluation of BioOil production from microalgae by thermochemical liquefaction and pyrolysis. *Energy & Fuels*, 25, 5472–5482.
4. **Jena, U.**, K.C. Das and J.R. Kastner. 2011. Effect of operating conditions of thermochemical liquefaction on biocrude production from *Spirulina platensis*. *Bioresource Technology* 102(10): 6221-6229.
5. **Jena, U.**, N. Vaidyanathan, S. Chinnasamy and K.C. Das. 2010. Evaluation of microalgae cultivation using recovered aqueous solution from thermochemical liquefaction of algal biomass. *Bioresource Technology* 102(3): 3380-3387.
6. Singh, R.N., **U. Jena**, J.B. Patel and A.M. Sharma. 2006. Feasibility study of cashew nut shells as an open core gasifier feedstock. *Renewable Energy* 31: 481–487.

Manuscripts in Preparation

1. **Jena, U.** and K.C. Das. 2012. Investigation on the effect of hydrothermal pretreatment of paper mill sludge for production of biofuels and chemicals.
2. **Jena, U.**, R. Hayine, S. Chinnasamy, J.A. Herrin, J. L. Shelton, S.B. Wilde, and K.C. Das. A novel method of biofuels production using the Asian clam, *Corbicula fluminea* for bio-harvesting of algae and their subsequent thermochemical conversion.
3. **Jena, U.**, K.C. Das and J.R. Kastner. Effect of addition of low cost chemicals on pyrolytic and oxidative decomposition of paper mill sludge, paulownia waste and microalgae.

Proceedings

1. **Jena, U.** and K. C. Das. 2009. Production of biocrude oil from microalgae via thermochemical liquefaction process, *Bioenergy Engineering, 11-14 Oct 2009, Bellevue, Washington, BIO-098024*.
2. **Jena, U.** and J.B. Patel. 2005. "Open core gasifier for chicory roasting - a case study". *International Agricultural Engineering Conference, Bangkok, Thailand, EAG-009 (ISBN 974-93752-6-2)*.
3. Patel, J.B., **U. Jena**, D.V. Kapatel, V.B. Patel. 2005. Recycling of wastewater generated during Producer Gas Conditioning. *Indian Society of Agricultural Engineering 39th Annual meeting*" Hyderabad, India.
4. **Jena, U.**, E.V. Thomas and V.V.N. Kishore. 2004. "Cyclone separator - a first stage producer gas cleaning unit". *Paper No. SEP-8, Indian Chemical Engineering Congress, Mumbai, India*.

Technical Reports

1. **Jena, U.**, S. Mani, J. R. Kastner, R. Hilton, J. Miller, K.C. Das. Upgrading of Fast Pyrolysis Bio-oil into Drop-in-biofuels. Prepared for the Oak Ridge National Laboratory, under the subcontract # 4000107218, March 2012.
2. **Jena, U.**, B.S. Pathak, NSL Srivastava 2005. Development and Field Evaluation of a 25000 Kcal/h Agro-residue based open-core gasifier at Vimsons Chicory Corp." Final report submitted to the Ministry of Non-Conventional Energy Sources, New Delhi, India, March 2005.

ABSTRACTS AND PRESENTATIONS

1. Jena, U., S. Kent Hoekman, Amber Broch, Curtis Robbins. "Hydrothermal Conversion of Biomass into Pelletizable Coal-Like Biofuel: DRI's Experience", at the *Southeast Bioenergy Conference, Atlanta, GA, February, 2013*.
2. Jena, U., Roger Hilten, Joby Miller, James Kastner, Sudhagar Mani, K.C. Das, Bruce Bunting. "Catalytic hydrogenation of fast pyrolysis bio-oil", at the *Bioenergy Systems Research Initiative Annual Retreat, Athens, Georgia, April 2012*.
3. Jena, U., K.C. Das. "Production of biocrude and high value aqueous co-products from algae in a biorefinery process", at the *Institute of Biological Engineering Annual Meeting, Indianapolis, IN, March 2012*.
4. Jena, U., K.C. Das. "Co-solvent liquefaction of *Spirulina platensis*", at the *American Society of Agricultural and Biological Engineering (ASABE) Annual Meeting, Louisville, KY, August 2011*.
5. Jena, U., K.C. Das. "Production of biofuels and value added co-products from microalgae" at the *Annual Interdisciplinary Research Day of the University of Georgia, Athens, GA, May 2011*.
6. Jena, U., K.C. Das. "Thermochemical liquefaction of microalgae for biocrude production" at the *Bioenergy Systems Research Initiative Annual Retreat, Athens, Georgia, November 2010*.
7. Jena, U., K.C. Das. "Effect of hydrothermal pretreatment on the thermochemical conversion of paper mill sludge into fuels and chemicals", at *ASABE Annual Meeting, Pittsburg, PA, June 2010*.
8. Jena, U. and K. C. Das. 2009. Production of biocrude oil from microalgae via thermochemical liquefaction process, *Bioenergy Engineering, 11-14 Oct 2009, Bellevue, Washington, BIO-098024*.
9. Jena, U., K.C. Das. "State of art of the thermochemical liquefaction of biomass for biofuel generation", at the *ASABE Annual Meeting, Reno, NV, June 2009*.
10. Jena, U., N. Vaidyanathan, S. Chinnasamy and K.C. Das. "Microalgae biofuels and Carbon Cycling" at the *Air & Waste Management Association, GA Chapter's Annual Environmental Conference, Atlanta, GA, October 2009*.
11. Jena, U., K.C. Das. "Thermochemical conversion of microalgal biomass for transport fuel production" *Annual Interdisciplinary Research Day of the Univ. of Georgia, Athens, July 2009*.
12. Jena, U., S. Chinnasamy, S. Mani, K.C. Das "Thermochemical liquefaction of microalgae into biofuels", at *Air & Waste Management Association's Annual Conference, Atlanta, GA, Oct 2008*.
13. Jena, U., K.C. Das. "Kinetic study of catalytic decomposition of paper mill sludge, paulownia wood waste and microalgae using thermo gravimetric analyzer", at *ASABE Annual Meeting, Providence, RI, June 2008*.
14. Jena, U., K.C. Das. "Influence of catalysts on gasification of paper mill sludge, paulownia wood waste and microalgae" at the *annual meeting of Institute of Biological Engineering, Chappel Hill, NC, USA. March 2008*.
15. Jena, U., J.B. Patel, V.B. Patel. "Development of combustion chamber for sand preheating", at the *Symposium of Academy of Environment, Athens, Georgia. October 2006*.
16. Jena, U., J.B. Patel, Singh R. N. "Down draft gasification of cashew nut shells" at the *Indian Society of Agricultural Engineering 39th Annual meeting* Hyderabad, India, March 2005.
17. Jena, U. and J.B. Patel. 2005. "Open core gasifier for chicory roasting - a case study". Presented at the *International Agricultural Engineering Conference, Bangkok, Thailand, December 2005*.
18. Patel, J.B., U. Jena, D.V. Kapatel, V.B. Patel. 2005. Recycling of wastewater generated during Producer Gas Conditioning. Presented at the *Indian Society of Agricultural Engineering 39th Annual meeting* Hyderabad, India, March 2005.
19. Jena, U., E.V. Thomas and V.V.N. Kishore. 2004. "Cyclone separator - a first stage producer gas cleaning unit". Presented at *Indian Chemical Engineering Congress, Mumbai, India, Dec 2004*.

RESEARCH GRANTS

Awarded/Pending

- “*Development of bio-oil commodity fuel as a refinery feedstock from high impact algae feedstock*”, submitted to the U.S. Department of Energy, 2012; (Amount: \$665,000; *Awarded*).
- “*Integrated biochemical-hydrothermal treatment of poultry manure for waste reduction, biofuel production and environmental quality enhancement*”, submitted to the Binational Science Foundation (USA-Israel), 2012; (Amount \$200,000; *Pending*).
- “*Two-step HTC pretreatment of woody biomass for recovery of sugars and energy dense hydrochar*”, submitted to American Process Inc., Atlanta, GA, 2012; (Amount, \$49,750; *Pending*).
- “*Development of technology for preheating and briquetting of selected crop residues*”, to the Indian Council of Agricultural Research, Ministry of Agriculture, Government of India, 2004. My Role: Co-PI (55% contribution) (INR 1,250,000; *Awarded*).
- “*Design and development of producer gas quality improvement system for high capacity gasifiers using organic medium*”, Gujarat Energy Development Agency, India, 2005; My Role: Co-PI (50% contribution); (Amount: INR 75,000; *Awarded*).

Not Awarded

- “*Development of a Continuous Algal Fuel Reactor System*”, submitted to the Division of Atmospheric Sciences of the Desert Research Institute, 2012 My Role (PI), (Amount, \$80,279)
- “*Algae biorefinery research and development*”, Indo-US Joint Clean Energy Center, 2011; (Amount: \$1,250,000).
- “*Minimal-input algal fuel production with water improvement benefits*”, submitted to the U.S. Department of Agriculture, 2010; (Amount: \$4,000,000).
- “*Remediation of endocrine disrupting compounds from septic tank effluents using biomass derived char and sand barriers*”, submitted to U.S. EPA in 2008; (Amount: \$10,000).
- “*Supercritical water gasification of paper mill sludge for energy production*”, for Georgia Research Alliance Energy Research Seed Grant, GA, 2006. (Amount: \$68,000).
- “*Coupled bioenergy and biochar generation for sustainable land use, improved industrial efficiency and carbon trading*” submitted to the U.S. Environmental Protection Agency (4th People, Prosperity and Planet Awards) in 2006; (Amount: \$10,000).

ACADEMIC AWARDS AND ACCOMPLISHMENTS

- *Nell J. Redfield Foundation Scholarship in Renewable Energy, selected to receive the fellowship from the Redfield Foundation of Nevada, 2012-2014.*
- *Grant H. Flint International Scholarship Award (Category: Veolia ES Waste-to-Energy Award), Awarded by the Solid Waste Association of North America (SWANA), 2009-2010.*
- *Scholarship for Excellence in Sustainable Development Research and Study, Awarded by the Air and Waste Management Association (A&WMA), 2009.*
- *Best Graduate Students' Research and Education, Awarded by Southern Section of AWMA, 2008.*
- *Emerging Leaders Award, Awarded by the Graduate School, University of Georgia, 2008.*
- *Best Oral Presentation, Annual Research Symposium of the Graduate Students and Postdoctorals in Sciences, the University of Georgia, 2009.*
- *Best Poster Awards (second position) for Graduate Students' Research Category, Bioenergy Systems Research Initiative Annual Retreat 2010.*
- *Brahm Verma Award for the Academic and Leadership Excellence (honorable mention), Awarded by the Faculty of Engineering, the University of Georgia, 2009.*
- *The Blue Key National Honor Society, inducted into the University of Georgia Chapter, 2009.*

- *Internship offer from Forschungszentrum Karlsruhe, Karlsruhe Institute of Technology, GmbH, Karlsruhe, Germany to work on hydrothermal conversion of biomass in fall, 2009 (not attended).*
- *Graduate Research and Teaching Assistantship, the University of Georgia, 2006-2011.*
- *Graduate Fellowship, the Ministry of Human Resources Development (HRD), India, 2001-2003.*
- *Qualified the National Eligibility Test, conducted by Agricultural Scientists Recruitment Board for Agricultural Research Scientists of the Indian Council of Agricultural Research, 2005.*
- *Qualified the All India level Graduate Aptitude Test in Engineering, India, 2001.*
- *Travel Award to attend the A&WMA's Annual Conference and Exhibition, The Southern Section and the Georgia Chapter of Air and Waste Management Association, 2009.*
- *Travel Award to attend the ASABE annual international meeting, Graduate School, the University of Georgia, 2008 & 2009.*
- *Travel award to take part and present research paper at the International Agricultural Engineering Conference at Bangkok, (Thailand) from the Department of Science & Technology, India 2005.*

COMMUNITY SERVICE AND ACTIVITIES

Peer reviewing panel

- Member of the Editorial Board, Journal of Technology Innovations in Renewable Energy, 2012.
- Reviewer of grant proposals:
 - The Foundation for Science and Technology (Fundação para a Ciência e Tecnologia), the Portuguese public research, 2012.
 - United States Department of Agriculture- Phase-I Small Business Innovative Research Program & Sustainable Bioenergy Research program, 2010-2011.
- Manuscript Reviewer in over 10 journals and reviewed 14 manuscripts for Applied Energy, Biofuel (Future Science Group), Biological Engineering Transactions, Biomass Conversion and Biorefinery, Energy & Environmental Science, Energy & Fuels, Energy Conversion management, Transactions of American Society of Biological & Agricultural Engineering, and Waste Management, 2010-2013.
- Reviewer, for student platform paper award competition, 102nd and 103rd Annual Conferences and Exhibitions of the Air & Waste Management Association (A&WMA), 2009-2010.
- Paper Reviewer and Judge, (in engineering category), Georgia Junior Humanities and Science Conference (GJHS), a state wide high school competition, 2008 & 2009.
- Judge, poster competition (in Energy & Transportation category) in the Georgia Science and Engineering Fair, 2008, 2009 & 2012.
- Judge/Mentor, Spirit of Innovation Challenge, Peter Conrad Science Foundation, An award competition for high school students. 2010-2012.

Committees

- Member, Bioconversion and Bioprocesses Committee (BE-28) of the American Society of Agricultural and Biological Engineering, 2010- present.
- Scribe, inaugural faculty assembly of the University of Georgia-College of Engineering, Aug, 2012.
- Session organizer, Biofuels and Bioproducts: Algae-Based Systems, Institute of Biological Engineering Annual Meeting 2012 held at Indianapolis, March 1-3, 2012-2013.
- Member, Graduate Advisory Committee, Department of Biological and Agricultural Engineering, the University of Georgia, 2008-2010.
- Graduate representative, Brahm Verma Graduate student award committee, conducted selection process for Brahm Verma Graduate student award, 2009-2010.
- Secretary, Biological and Agricultural Engineering Dept. Club, University of Georgia, 2007- 2008

- Graduate Representative and Member, Graduate Students & Postdocs in Science, the University of Georgia 2009-2010.

SELECTED INVITED TALKS

1. **Jena, U.** “Thermochemical liquefaction technology: a route for conversion of algae into liquid hydrocarbons”, Department of Biochemistry and Molecular Biology, University of Nevada Reno, Nevada, 2012.
2. **Jena, U.** “Thermochemical Conversion of algae and biomass into biofuels and co-products”, Fort Valley State University, Fort Valley, Georgia,.
3. **Jena, U.** “Thermochemical conversion of microalgae into biofuels and nutrient recycling in an integrated biorefinery approach”. Faculty of Engineering, The University of Georgia, Athens, 2010.

MEMBERSHIP ACTIVITIES

- *American Society of Agricultural & Biological Engineering*, **Member**, 2008-present.
- *Sigma Xi Scientific Research Society*, **Associate Member**, 2008-2011.
- *American Association of Colleges and Universities*, **Member and Campus Associate**, 2009-2010.
- *Institute of Biological Engineering*, **Associate Member**, 2008-present.
- *Air and Waste Management Association*, **Student Member**, 2008-2010.
- *Solid Waste Association of North America*, **Student Member**, 2009-2011.
- *ASTM International (American Society for Testing and Materials)*, **Student Member**, 2009-2011.
- *Global Association of Risk Professionals*, **Affiliate Member**, 2011-present.
- *Order of the Engineer*, **Member**, 2008-present.
- *Indian Society of Agricultural Engineering*, **Life Member**, 2004-present.
- *Toastmasters International, Club # 1779, GA*, **Member**, 2011-2012.