

Publications from the Research Work

Published Research paper

1. Reetu Raj, Jeewan Vachan Tirkey, **Deepak Kumar Singh**, Priyaranjan Jena (2023). Co-gasification of waste triple feed-material blends using downdraft gasifier integrated with dual fuel diesel engine: An RSM-based comparative parametric optimization. *Journal of the Energy Institute* 109 (2023) 101271 (ELSEVIER, SCI-IF: 6.47)
2. Reetu Raj, **Deepak Kumar Singh**, Jeewan Vachan Tirkey (2023). Gasifier-Engine performance analysis using Co-gasification of Mahua wood waste and Saw-dust briquette blend: An experimental and optimization approach. *Biomass Conversion and Biorefinery*, (Springer, SCI-IF-4.1, Q1) ACCEPTED on 26-04-2023.
3. Reetu Raj, **Deepak Kumar Singh**, Jeewan Vachan Tirkey (2023). Performance Simulation and Optimization of SI engine fueled with Peach biomass-based producer gas and propane blend. *Thermal Science and Engineering Progress*, 41 (2023) 101816 (ELSEVIER, SCI-IF: 4.56).
4. **Deepak kumar Singh**, Raj R, Tirkey JV (2022). Performance and Emission Analysis of triple fuelled CI engine utilizing producer gas, biodiesel and diesel: An optimization study using response surface methodology. *Thermal Science and Engineering Progress*. 2022 Sep 27:101486. (Published) (IF- 4.56)
5. Raj, Reetu, **Deepak Kumar Singh**, and J. V. Tirkey (2022). "Co-gasification of Low-grade coal with Madhuca longifolia (Mahua) biomass and dual-fuelled mode engine performance: Effect of biomass blend and engine operating condition." *Energy Conversion and Management* 269 (2022): 116150. (Published) (IF-11.53)
6. **Deepak Kumar Singh**, Jeewan Vachan Tirkey (2022). Optimization of performance and emission characteristics of CI engine fuelled with waste Safflower oil biodiesel and its blends. Accepted for printing in: *Petroleum Science and Technology*. (Published) (IF- 1.539)
7. **Deepak Kumar Singh**, Jeewan Vachan Tirkey (2022). Performance optimization through response surface methodology of an integrated coal gasification and CI Engine fuelled with diesel and low-grade coal-based producer gas. *Energy, The International Journal*, 238, Part C, 1 January 2022, 121982, <https://doi.org/10.1016/j.energy.2021.121982>. (Published) (IF- 8.8)
8. **Deepak Kumar Singh**, J.V. Tirkey (2022). Process modelling and thermodynamic performance optimization of biomass air gasification fuelled with waste poultry litter pellet by integrating Aspen plus with RSM. *Biomass and Bioenergy* 158 (2022) 106370. (Published). (IF-5.77)
9. Tirkey, J.V., Kumar, A. and **Singh, D.K.**, (2022). Energy consumption, greenhouse gas emissions and economic feasibility studies of biodiesel production from Mahua (*Madhuca longifolia*) in India. *Energy*, 249, p.123690. (Published) (IF- 8.8)
10. Parthasarathy P, Fernandez A, **Singh DK** , Al-Ansari T, Mackey HR, Rodriguez R, Mazza G, Tirkey JV, McKay G (2002). Thermogravimetric analysis of camel dung,

date stone, and their blend for pyrolytic, kinetic, and thermodynamic Studies Cleaner Chemical Engineering. 2022 Oct 13:100072. (Published)

11. **Deepak Kumar Singh**, and Jeewan V. Tirkey (2021). "Modeling and multi-objective optimization of variable air gasification performance parameters using Syzygium cumini biomass by integrating ASPEN Plus with Response surface methodology (RSM)." International Journal of Hydrogen Energy 46.36 (2021): 18816-18831 (Published) (IF-7.13)
12. **Deepak Kumar Singh** & Jeewan V Tirkey (2021) Valorization of Hazardous Medical Waste using Steam injected Plasma Gasifier: A Parametric Study on the Modeling and Multi-Objective Optimization by integrating Aspen Plus with RSM, Environmental Technology, DOI: 10.1080/09593330.2021.1946599 (Published) (IF- 3.24)
13. Jeewan Vachan Tirkey, **Deepak Kumar Singh** (2021). Performance and emission optimization of CI engine fueled with coconut shell-based producer gas and diesel by using response surface methodology. Biomass Conv. Bioref. (2021). <https://doi.org/10.1007/s13399-021-01994-w> (Published) (IF- 4.0)
14. Jeewan Vachan Tirkey, **Deepak Kumar Singh** (2021). Thermodynamic performance and emission prediction of CI engine fuelled with diesel and Vachellia nilotica (Babul) biomass-based producer gas and optimization using RSM. Petroleum Science and Technology. <https://doi.org/10.1080/10916466.2021.2010756>. (Published) (IF- 1.5).
15. Reetu Raj, **Deepak Kumar Singh**, Jeevan Vachan Tirkey (2022). Co-gasification of Plastic waste blended with coal and biomass: A Comprehensive Review, Environmental Technology Reviews, accepted on 6 Dec 2022, (Taylor and Francis-Publication SCI-IF: 7.67)

Under Revision Submitted Manuscript

16. **Deepak Kumar Singh**, Reetu Raj. Simulation based Performance evaluation of Rice husk producer gas and propane blend fueled SI engine and optimization with RSM. Sustainable Energy Technologies and Assessments. (**Revision Submitted**) (IF- 7.63)
17. **Deepak Kumar Singh**, Reetu Raj, Prakash Parthasarathy, Tareq Al-Ansari, Gordon Mckay, Jeewan Vachan Tirkey. "Comparative analysis of Conventional and Advance version of gasification for the decentralized energy generation: An Outlook & Critical review". Environmental Technology Reviews (**Revision submitted**) (IF- 7.32)

International Conferences

1. **Deepak kumar singh**, J.V Tirkey, Ambesh Pandey, Deepak mittal "Experimental Investigation of Gasifier Integrated with IC Engine Fuelled with Jamun (Syzygium Cumini) Biomass". (Paper accepted for poster presentation) ICOMS 2020 NCL Singrauli M.P
2. J.V. Tirkey, S.K. Shukla, **Deepak K Singh** (2019). Thermodynamic investigation of the effects of lean combustion on the performance of SI engine fueled with Propane producer gas blends. International Conference on Green Technologies Circular Economy and Restoration of Cultural Heritage. RBS College, Agra, 2019 pp 56.

3. **Deepak kumar singh**, J.V Tirkey, Hemant kumar, Ritesh Sonkar, Jitendra singh. “Co-gasification of Low-grade coal and Waste Biomass blend: Experimental Investigation and RSM based parametric optimization of dual fuel CI Engine”. ICOMS 2021 NCL Singrauli M.P (Accepted)
4. J.V Tirkey, **Deepak Kumar singh**, Reetu Raj, Roshan Patel, Mahendra pal. “Valorization of gasified low-grade coal fly ash in concrete mixture and parametric optimization of engine performance and emission fuelled with producer gas”. (Paper accepted for poster presentation) ICOMS 2021 NCL Singrauli M.P
5. **Deepak Kumar Singh**, Jeewan Vachan Tirkey. Performance and Emission Analysis of triple fuelled CI engine utilizing producer gas, biodiesel and diesel: An optimization study using response surface methodology. (Paper accepted for oral presentation) Chemplus IIT Madras 2022.

References

1. Maroušek, J., et al., *Advances in the agrochemical utilization of fermentation residues reduce the cost of purpose-grown phytomass for biogas production*. Energy Sources, Part A: Recovery, Utilization, and Environmental Effects, 2020: p. 1-11.
2. Das, S., et al., *Clean gaseous fuel application in diesel engine: A sustainable option for rural electrification in India*. Renewable and Sustainable Energy Reviews, 2020. **117**: p. 109485.
3. Bhattacharyya, S.C., *Energy access problem of the poor in India: Is rural electrification a remedy?* Energy policy, 2006. **34**(18): p. 3387-3397.
4. Ahmad, T. and D. Zhang, *A critical review of comparative global historical energy consumption and future demand: The story told so far*. Energy Reports, 2020. **6**: p. 1973-1991.
5. Mardoyan, A. and P. Braun, *Analysis of Czech subsidies for solid biofuels*. International Journal of Green Energy, 2015. **12**(4): p. 405-408.
6. Maroušek, J., A. Maroušková, and T. Kůs, *Shower cooler reduces pollutants release in production of competitive cement substitute at low cost*. Energy Sources, Part A: Recovery, Utilization, and Environmental Effects, 2020: p. 1-10.
7. !!! INVALID CITATION !!! (Reed and Das 1988, Beenackers 1999, Jain and Goss 2000, Tinaut, Melgar et al. 2006).
8. Mofijur, M., et al., *Potential of rice industry biomass as a renewable energy source*. Energies, 2019. **12**(21): p. 4116.
9. Warnecke, R., *Gasification of biomass: comparison of fixed bed and fluidized bed gasifier*. Biomass and bioenergy, 2000. **18**(6): p. 489-497.
10. Digman, B., H.S. Joo, and D.S. Kim, *Recent progress in gasification/pyrolysis technologies for biomass conversion to energy*. Environmental Progress & Sustainable Energy: An Official Publication of the American Institute of Chemical Engineers, 2009. **28**(1): p. 47-51.

11. Caballero, M.A., et al., *Biomass gasification with air in fluidized bed. Hot gas cleanup with selected commercial and full-size nickel-based catalysts*. Industrial & Engineering Chemistry Research, 2000. **39**(5): p. 1143-1154.
12. Bridgwater, A.V., *Renewable fuels and chemicals by thermal processing of biomass*. Chemical engineering journal, 2003. **91**(2-3): p. 87-102.
13. Bridgwater, A., D. Meier, and D. Radlein, *An overview of fast pyrolysis of biomass*. Organic geochemistry, 1999. **30**(12): p. 1479-1493.
14. Salaudeen, S., P. Arku, and A. Dutta, *Gasification of plastic solid waste and competitive technologies*, in *Plastics to Energy*. 2019, Elsevier. p. 269-293.
15. Sheth, P.N. and B. Babu, *Experimental studies on producer gas generation from wood waste in a downdraft biomass gasifier*. Bioresource technology, 2009. **100**(12): p. 3127-3133.
16. Tinaut, F.V., et al., *Effect of biomass particle size and air superficial velocity on the gasification process in a downdraft fixed bed gasifier. An experimental and modelling study*. Fuel processing technology, 2008. **89**(11): p. 1076-1089.
17. Ryu, C., et al., *Effect of fuel properties on biomass combustion: Part I. Experiments—fuel type, equivalence ratio and particle size*. Fuel, 2006. **85**(7-8): p. 1039-1046.
18. AlNouss, A., G. McKay, and T. Al-Ansari, *A comparison of steam and oxygen fed biomass gasification through a techno-economic-environmental study*. Energy Conversion and Management, 2020. **208**: p. 112612.
19. Maroušek, J., et al., *Techno-economic assessment of potato waste management in developing economies*. Clean Technologies & Environmental Policy, 2020. **22**(4).
20. Maroušek, J., et al., *Modified biochars present an economic challenge to phosphate management in wastewater treatment plants*. Journal of Cleaner Production, 2020. **272**: p. 123015.
21. Maroušek, J., O. Strunecký, and V. Stehel, *Biochar farming: Defining economically perspective applications*. Clean Technologies and Environmental Policy, 2019. **21**(7): p. 1389-1395.
22. Midilli, A., et al., *Combustible gas production from sewage sludge with a downdraft gasifier*. Energy Conversion and management, 2001. **42**(2): p. 157-172.
23. Singh, D.K. and J.V. Tirkey, *Modeling and multi-objective optimization of variable air gasification performance parameters using Syzygium cumini biomass by integrating ASPEN Plus with Response surface methodology (RSM)*. International Journal of Hydrogen Energy, 2021. **46**(36): p. 18816-18831.
24. Mirmoshtaghi, G., et al., *The influence of different parameters on biomass gasification in circulating fluidized bed gasifiers*. Energy Conversion and Management, 2016. **126**: p. 110-123.
25. Overend, R.P., *Thermochemical conversion of biomass*. Renewable Energy Sources Charged with Energy from the Sun and Originated from Earth-Moon Interaction, Evald E. Shpilrain ed., in Encyclopedia of Life Support Systems (EOLSS), developed under the Auspices of the UNESCO. Eolss Publishers, Oxford, 2004.
26. Bhoi, P.R., et al., *Scale-up of a downdraft gasifier system for commercial scale mobile power generation*. Renewable Energy, 2018. **118**: p. 25-33.
27. Nwakaire, J. and B. Ugwuishiwu, *Development of a natural cross draft gasifier stove for application in rural communities in Sub-Saharan Africa*. Journal of Applied Sciences, 2015. **15**(9): p. 1149.
28. Bermudez, J. and B. Fidalgo, *Production of bio-syngas and bio-hydrogen via gasification*, in *Handbook of Biofuels Production*. 2016, Elsevier. p. 431-494.
29. Miller, B., *Formation and Control of Nitrogen*. Clean Coal Engineering Technology. 2017, Butterworth-Heinemann.

30. world, w.m., *Plasma Gasification Turning Waste to Fuel in China*, in *waste management world*. 2020: china.
31. commercialization, P.g., *Plasma gasification commercialization*, in *wikipedia*, wikipedia, Editor. 2020.
32. Guo, L., H. Jin, and Y. Lu, *Supercritical water gasification research and development in China*. The Journal of Supercritical Fluids, 2015. **96**: p. 144-150.
33. Davis, B.H., *Fischer–Tropsch synthesis: overview of reactor development and future potentialities*. Topics in catalysis, 2005. **32**(3-4): p. 143-168.
34. McKendry, P., *Energy production from biomass (part 1): overview of biomass*. Bioresource technology, 2002. **83**(1): p. 37-46.
35. Vassilev, S.V., et al., *An overview of the chemical composition of biomass*. Fuel, 2010. **89**(5): p. 913-933.
36. Wang, L., et al., *Contemporary issues in thermal gasification of biomass and its application to electricity and fuel production*. Biomass and bioenergy, 2008. **32**(7): p. 573-581.
37. Banerjee, R., *Comparison of options for distributed generation in India*. Energy policy, 2006. **34**(1): p. 101-111.
38. Tripathi, A.K., P. Iyer, and T.C. Kandpal, *A financial evaluation of biomass-gasifier-based power generation in India*. Bioresource technology, 1997. **61**(1): p. 53-59.
39. Sansaniwal, S., et al., *Recent advances in the development of biomass gasification technology: A comprehensive review*. Renewable and sustainable energy reviews, 2017. **72**: p. 363-384.
40. Gai, C. and Y. Dong, *Experimental study on non-woody biomass gasification in a downdraft gasifier*. International Journal of hydrogen energy, 2012. **37**(6): p. 4935-4944.
41. Olgun, H., S. Ozdogan, and G. Yinesor, *Results with a bench scale downdraft biomass gasifier for agricultural and forestry residues*. biomass and bioenergy, 2011. **35**(1): p. 572-580.
42. Guo, F., et al., *Effect of design and operating parameters on the gasification process of biomass in a downdraft fixed bed: An experimental study*. International Journal of Hydrogen Energy, 2014. **39**(11): p. 5625-5633.
43. Striūgas, N., et al., *An evaluation of performance of automatically operated multi-fuel downdraft gasifier for energy production*. Applied thermal engineering, 2014. **73**(1): p. 1151-1159.
44. Galindo, A.L., et al., *Biomass gasification in a downdraft gasifier with a two-stage air supply: Effect of operating conditions on gas quality*. biomass and bioenergy, 2014. **61**: p. 236-244.
45. Guangul, F.M., S.A. Sulaiman, and A. Ramli, *Gasifier selection, design and gasification of oil palm fronds with preheated and unheated gasifying air*. Bioresource technology, 2012. **126**: p. 224-232.
46. Sharma, A.K., *Experimental study on 75 kWth downdraft (biomass) gasifier system*. Renewable Energy, 2009. **34**(7): p. 1726-1733.
47. Nisamaneenate, J., et al., *Fuel gas production from peanut shell waste using a modular downdraft gasifier with the thermal integrated unit*. Renewable energy, 2015. **79**: p. 45-50.
48. Vyas, D. and R. Singh, *Feasibility study of Jatropha seed husk as an open core gasifier feedstock*. Renewable energy, 2007. **32**(3): p. 512-517.
49. Singh, R., et al., *Feasibility study of cashew nut shells as an open core gasifier feedstock*. Renewable energy, 2006. **31**(4): p. 481-487.

50. Ueki, Y., et al., *Gasification characteristics of woody biomass in the packed bed reactor*. Proceedings of the Combustion Institute, 2011. **33**(2): p. 1795-1800.
51. Machin, E.B., et al., *Tar reduction in downdraft biomass gasifier using a primary method*. Renewable Energy, 2015. **78**: p. 478-483.
52. Kallis, K.X., G.A.P. Susini, and J.E. Oakey, *A comparison between Miscanthus and bioethanol waste pellets and their performance in a downdraft gasifier*. Applied energy, 2013. **101**: p. 333-340.
53. Yoon, S.J., et al., *Gasification and power generation characteristics of rice husk and rice husk pellet using a downdraft fixed-bed gasifier*. Renewable Energy, 2012. **42**: p. 163-167.
54. Reed, T.B. and A. Das, *Handbook of biomass downdraft gasifier engine systems*. 1988: Biomass Energy Foundation.
55. Chopra, S. and A. Jain, *A review of fixed bed gasification systems for biomass*. 2007.
56. Beohar, H., et al., *Parametric study of fixed bed biomass gasifier: a review*. International Journal of Thermal Technologies, 2012. **2**(1): p. 134-140.
57. Mohanraj, C. and P. Srividhya, *CFD simulation of 20 kW downdraft gasifier*. Current Engineering and Technology, 2013. **3**: p. 209-214.
58. Martínez, J.D., et al., *Experimental study on biomass gasification in a double air stage downdraft reactor*. Biomass and Bioenergy, 2011. **35**(8): p. 3465-3480.
59. Jandačka, J., et al., *Experimental determination of bed temperatures during wood pellet combustion*. Energy & fuels, 2017. **31**(3): p. 2919-2926.
60. Somashekhar, H., S. Dasappa, and N. Ravindranath, *Rural bioenergy centres based on biomass gasifiers for decentralized power generation: case study of two villages in southern India*. Energy for Sustainable Development, 2000. **4**(3): p. 55-63.
61. Singh, R. and A.D. Setiawan, *Biomass energy policies and strategies: Harvesting potential in India and Indonesia*. Renewable and Sustainable Energy Reviews, 2013. **22**: p. 332-345.
62. over India, S.R.E., *Indian Meteorological Department and Ministry of New and Renewable Energy*. Govt. of India, 2008.
63. Sridhar, G.S.H., *Case Studies on Small Scale Biomass Gasifier Based Decentralized Energy Generation Systems*. 2006.
64. Jain, V. and S. Srinivas, *Empowering rural India the RE way: inspiring success stories*. Ministry of New and Renewable Energy, Government of India, Block, 2012(14).
65. Ranjan, A., *Water Issues in Himalayan South Asia: Internal Challenges, Disputes and Transboundary Tensions*. 2020: Springer Nature.
66. Vickers, N.J., *Animal communication: when i'm calling you, will you answer too?* Current biology, 2017. **27**(14): p. R713-R715.
67. Saha, A., *The India-Israeli Security Relationship: Nature, Scope and Challenges*. Strategic Analysis, 2019: p. 1-12.
68. Shrimali, G. and S. Tirumalachetty, *Renewable energy certificate markets in India—A review*. Renewable and Sustainable Energy Reviews, 2013. **26**: p. 702-716.
69. Abdullah, S.S. and S. Yusup, *Method for screening of Malaysian biomass based on aggregated matrix for hydrogen production through gasification*. Journal of Applied Sciences(Faisalabad), 2010. **10**(24): p. 3301-3306.
70. capture, c., *how gasification carbon capture works*. 2020.
71. Motta, I.L., et al., *Biomass gasification in fluidized beds: A review of biomass moisture content and operating pressure effects*. Renewable and Sustainable Energy Reviews, 2018. **94**: p. 998-1023.
72. Latif, A., *A study of the design of fluidized bed reactors for biomass gasification*. 1999, University of London.

73. Basu, P., *Combustion and gasification in fluidized beds*. 2006: CRC press.
74. Spliethoff, H., *Power generation from solid fuels*. 2010: Springer Science & Business Media.
75. Van der Drift, A. and C. van der Meijden. *Ways to increase the carbon conversion of a CFB gasifier*. in *CONTRIBUTIONS ECN BIOMASS TO THE "12th EUROPEAN CONFERENCE AND TECHNOLOGY EXHIBITION ON BIOMASS FOR ENERGY, INDUSTRY AND CLIMATE PROTECTION"*. 2002.
76. Li, X., et al., *Biomass gasification in a circulating fluidized bed*. *Biomass and bioenergy*, 2004. **26**(2): p. 171-193.
77. Hannula, I. and E. Kurkela, *Liquid transportation fuels via large-scale fluidised-bed gasification of lignocellulosic biomass*. 2013: VTT Technical Research Centre of Finland.
78. Rahimpour, M. and Z. Dehghani, *Membrane reactors for methanol synthesis from forest-derived feedstocks*, in *Membrane Technologies for Biorefining*. 2016, Elsevier. p. 383-410.
79. Bhattacharya, S. and H.-L. Pham, *A study on a multi-stage hybrid gasifier-engine system*. *Biomass and Bioenergy*, 2001. **21**(6): p. 445-460.
80. Bhoi, P., et al., *Performance evaluation of open core gasifier on multi-fuels*. *Biomass and Bioenergy*, 2006. **30**(6): p. 575-579.
81. Lv, P., et al., *Hydrogen-rich gas production from biomass air and oxygen/steam gasification in a downdraft gasifier*. *Renewable energy*, 2007. **32**(13): p. 2173-2185.
82. Guangul, F.M., S.A. Sulaiman, and A. Ramli, *Study of the effects of operating factors on the resulting producer gas of oil palm fronds gasification with a single throat downdraft gasifier*. *Renewable energy*, 2014. **72**: p. 271-283.
83. Zainal, Z., et al., *Experimental investigation of a downdraft biomass gasifier*. *Biomass and bioenergy*, 2002. **23**(4): p. 283-289.
84. Maiti, S., et al., *Feasibility study of jatropha shell gasification for captive power generation in biodiesel production process from whole dry fruits*. *Fuel*, 2014. **121**: p. 126-132.
85. Sharma, S. and P.N. Sheth, *Air-steam biomass gasification: experiments, modeling and simulation*. *Energy conversion and management*, 2016. **110**: p. 307-318.
86. Favas, J., E. Monteiro, and A. Rouboa, *Hydrogen production using plasma gasification with steam injection*. *international journal of hydrogen energy*, 2017. **42**(16): p. 10997-11005.
87. Gagliano, A., et al., *Development of an equilibrium-based model of gasification of biomass by Aspen Plus*. *Energy Procedia*, 2017. **111**: p. 1010-1019.
88. Mojaver, P., S. Khalilarya, and A. Chitsaz, *Multi-objective optimization using response surface methodology and exergy analysis of a novel integrated biomass gasification, solid oxide fuel cell and high-temperature sodium heat pipe system*. *Applied Thermal Engineering*, 2019. **156**: p. 627-639.
89. Sutar, K.B., S. Kohli, and M. Ravi, *Design, development and testing of small downdraft gasifiers for domestic cookstoves*. *Energy*, 2017. **124**: p. 447-460.
90. Ahmed, S., et al., *Proximate composition and antioxidant activity of Syzygium cumini fruit grown at different regions in Bangladesh*. *Food Research*, 2020. **4**(5): p. 1693-1699.
91. Gao, X., et al., *Simulation and optimization of rice husk gasification using intrinsic reaction rate based CFD model*. *Renewable Energy*, 2019. **139**: p. 611-620.
92. Han, J., et al., *Modeling downdraft biomass gasification process by restricting chemical reaction equilibrium with Aspen Plus*. *Energy conversion and management*, 2017. **153**: p. 641-648.

93. Silva, V. and A. Rouboa, *Optimizing the gasification operating conditions of forest residues by coupling a two-stage equilibrium model with a response surface methodology*. Fuel Processing Technology, 2014. **122**: p. 163-169.
94. Dang, Q., et al., *Prediction and optimization of syngas production from a kinetic-based biomass gasification process model*. Fuel Processing Technology. **212**: p. 106604.
95. Wang, H., D. Chaffart, and L.A. Ricardez-Sandoval, *Modelling and optimization of a pilot-scale entrained-flow gasifier using artificial neural networks*. Energy, 2019. **188**: p. 116076.
96. Bassyouni, M., et al., *Date palm waste gasification in downdraft gasifier and simulation using ASPEN HYSYS*. Energy conversion and management, 2014. **88**: p. 693-699.
97. Wei, L., et al., *Syn-gas quality evaluation for biomass gasification with a downdraft gasifier*. Transactions of the ASABE, 2009. **52**(1): p. 21-37.
98. Ramzan, N., et al., *Simulation of hybrid biomass gasification using Aspen plus: A comparative performance analysis for food, municipal solid and poultry waste*. Biomass and bioenergy, 2011. **35**(9): p. 3962-3969.
99. Song, G., et al., *Technical assessment of synthetic natural gas (SNG) production from agriculture residuals*. Journal of Thermal Science, 2013. **22**(4): p. 359-365.
100. Nikoo, M.B. and N. Mahinpey, *Simulation of biomass gasification in fluidized bed reactor using ASPEN PLUS*. Biomass and bioenergy, 2008. **32**(12): p. 1245-1254.
101. Ma, Z., et al., *Gasification of rice husk in a downdraft gasifier: the effect of equivalence ratio on the gasification performance, properties, and utilization analysis of byproducts of char and tar*. BioResources, 2015. **10**(2): p. 2888-2902.
102. Xiao, R., et al., *High-temperature air/steam-blown gasification of coal in a pressurized spout-fluid bed*. Energy & Fuels, 2006. **20**(2): p. 715-720.
103. Begum, S., et al., *Performance analysis of an integrated fixed bed gasifier model for different biomass feedstocks*. Energies, 2013. **6**(12): p. 6508-6524.
104. Keche, A.J., A.P.R. Gaddale, and R.G. Tated, *Simulation of biomass gasification in downdraft gasifier for different biomass fuels using ASPEN PLUS*. Clean Technologies and Environmental Policy, 2015. **17**(2): p. 465-473.
105. Lv, P., et al., *An experimental study on biomass air–steam gasification in a fluidized bed*. Bioresource technology, 2004. **95**(1): p. 95-101.
106. Skoulou, V., et al., *Syngas production from olive tree cuttings and olive kernels in a downdraft fixed-bed gasifier*. International journal of hydrogen energy, 2008. **33**(4): p. 1185-1194.
107. Lahijani, P. and Z.A. Zainal, *Gasification of palm empty fruit bunch in a bubbling fluidized bed: a performance and agglomeration study*. Bioresource technology, 2011. **102**(2): p. 2068-2076.
108. Ravikiran, A., et al., *Generalized analysis of gasifier performance using equilibrium modeling*. Industrial & engineering chemistry research, 2012. **51**(4): p. 1601-1611.
109. Niu, M., et al., *Simulation of syngas production from municipal solid waste gasification in a bubbling fluidized bed using Aspen Plus*. Industrial & Engineering Chemistry Research, 2013. **52**(42): p. 14768-14775.
110. Roy, D., S. Samanta, and S. Ghosh, *Performance optimization through response surface methodology of an integrated biomass gasification based combined heat and power plant employing solid oxide fuel cell and externally fired gas turbine*. Energy Conversion and Management, 2020. **222**: p. 113182.
111. Mishra, S., A. Sharma, and A. Kumari, *Response surface methodology based optimization of air-film blade cooled gas turbine cycle for thermal performance prediction*. Applied Thermal Engineering, 2020. **164**: p. 114425.

112. Puig-Arnavat, M., J.C. Bruno, and A. Coronas, *Review and analysis of biomass gasification models*. Renewable and sustainable energy reviews, 2010. **14**(9): p. 2841-2851.
113. Pinto, F., et al., *Effect of experimental conditions on co-gasification of coal, biomass and plastics wastes with air/steam mixtures in a fluidized bed system*. Fuel, 2003. **82**(15-17): p. 1967-1976.
114. Bartels, M., et al., *Agglomeration in fluidized beds at high temperatures: Mechanisms, detection and prevention*. Progress in Energy and Combustion Science, 2008. **34**(5): p. 633-666.
115. Renganathan, T., et al., *CO₂ utilization for gasification of carbonaceous feedstocks: a thermodynamic analysis*. Chemical engineering science, 2012. **83**: p. 159-170.
116. Sharma, A.K., *Modeling and simulation of a downdraft biomass gasifier 1. Model development and validation*. Energy Conversion and Management, 2011. **52**(2): p. 1386-1396.
117. Zaman, S.A., D. Roy, and S. Ghosh, *Process modeling and optimization for biomass steam-gasification employing response surface methodology*. Biomass and Bioenergy, 2020. **143**: p. 105847.
118. Singh, D.K. and J.V. Tirkey, *Valorization of Hazardous Medical Waste using Steam injected Plasma Gasifier: A Parametric Study on the Modeling and Multi-Objective Optimization by integrating Aspen Plus with RSM*. Environmental Technology, 2021(just-accepted): p. 1-30.
119. Zaman, S.A. and S. Ghosh, *A generic input-output approach in developing and optimizing an Aspen Plus steam-gasification model for biomass*. Bioresource Technology, 2021: p. 125412.
120. Singh, D.K. and J. Tirkey, *Process modelling and thermodynamic performance optimization of biomass air gasification fuelled with waste poultry litter pellet by integrating Aspen plus with RSM*. Biomass and Bioenergy, 2022. **158**: p. 106370.
121. Dubdub, I. and M. Al-Yaari, *Pyrolysis of mixed plastic waste: I. kinetic study*. Materials, 2020. **13**(21): p. 4912.
122. Pala, L.P.R., et al., *Steam gasification of biomass with subsequent syngas adjustment using shift reaction for syngas production: An Aspen Plus model*. Renewable Energy, 2017. **101**: p. 484-492.
123. Yoon, S.J., et al., *Hydrogen and syngas production from glycerol through microwave plasma gasification*. International journal of hydrogen energy, 2013. **38**(34): p. 14559-14567.
124. Mostafavi, E., et al., *Simulation of high-temperature steam-only gasification of woody biomass with dry-sorption CO₂ capture*. The Canadian Journal of Chemical Engineering, 2016. **94**(9): p. 1648-1656.
125. Couto, N., et al., *Hydrogen-rich gas from gasification of Portuguese municipal solid wastes*. international journal of hydrogen energy, 2016. **41**(25): p. 10619-10630.
126. Kumar, A., D.D. Jones, and M.A. Hanna, *Thermochemical biomass gasification: a review of the current status of the technology*. Energies, 2009. **2**(3): p. 556-581.
127. Materazzi, M., et al., *Performance analysis of RDF gasification in a two stage fluidized bed-plasma process*. Waste Management, 2016. **47**: p. 256-266.
128. Li, C., et al., *Experimental and modeling investigation of an integrated biomass gasifier-engine-generator system for power generation and waste heat recovery*. Energy Conversion and Management, 2019. **199**: p. 112023.
129. Shahbaz, M., et al., *A critical review on the influence of process parameters in catalytic co-gasification: current performance and challenges for a future prospectus*. Renewable and Sustainable Energy Reviews, 2020. **134**: p. 110382.

130. Zhu, H., et al., *Study on pyrolysis of typical medical waste materials by using TG-FTIR analysis*. Journal of Hazardous Materials, 2008. **153**(1-2): p. 670-676.
131. Diaz, G., et al., *Enhanced hydrogen production using steam plasma processing of biomass: Experimental apparatus and procedure*. international journal of hydrogen energy, 2015. **40**(5): p. 2091-2098.
132. Janajreh, I., S.S. Raza, and A.S. Valmundsson, *Plasma gasification process: Modeling, simulation and comparison with conventional air gasification*. Energy conversion and management, 2013. **65**: p. 801-809.
133. Tavares, R., A. Ramos, and A. Rouboa, *A theoretical study on municipal solid waste plasma gasification*. Waste Management, 2019. **90**: p. 37-45.
134. Pan, Z., et al., *Thermodynamic analyses of synthetic natural gas production via municipal solid waste gasification, high-temperature water electrolysis and methanation*. Energy Conversion and Management, 2019. **202**: p. 112160.
135. Sundaram, E.G. and E. Natarajan, *Pyrolysis of coconut shell: An experimental investigation*. The Journal of Engineering Research [TJER], 2009. **6**(2): p. 33-39.
136. Venkatesh, G., P.R. Reddy, and S. Kotari, *Generation of producer gas using coconut shells and sugar cane bagasse in updraft gasifier*. Materials Today: Proceedings, 2017. **4**(8): p. 9203-9209.
137. Su, L., et al., *Identifying main factors of capacity fading in lithium ion cells using orthogonal design of experiments*. Applied Energy, 2016. **163**: p. 201-210.
138. Singh, D.K. and J.V. Tirkey, *Performance optimization through response surface methodology of an integrated coal gasification and CI Engine fuelled with diesel and low-grade coal-based producer gas*. Energy, 2021: p. 121982.
139. Pramanik, K., *Properties and use of Jatropha curcas oil and diesel fuel blends in compression ignition engine*. Renewable energy, 2003. **28**(2): p. 239-248.
140. Sombatwong, P., P. Thaiyasuit, and K. Pianthong, *Effect of pilot fuel quantity on the performance and emission of a dual producer gas–diesel engine*. Energy procedia, 2013. **34**: p. 218-227.
141. Tirkey, J., *Simulation-based investigation of producer gas and propane blended SI engine for power generation application*. International Journal of Sustainable Energy, 2021. **40**(4): p. 344-363.
142. Sarada, S.N., et al., *Optimization of injection pressure for a compression ignition engine with cotton seed oil as an alternate fuel*. International Journal of Engineering, Science and Technology, 2010. **2**(6).
143. Raheman, H. and S. Ghadge, *Performance of diesel engine with biodiesel at varying compression ratio and ignition timing*. Fuel, 2008. **87**(12): p. 2659-2666.
144. Simsek, S. and S. Uslu, *Determination of a diesel engine operating parameters powered with canola, safflower and waste vegetable oil based biodiesel combination using response surface methodology (RSM)*. Fuel, 2020. **270**: p. 117496.
145. Nautiyal, P., et al., *Experimental assessment of performance, combustion and emissions of a compression ignition engine fuelled with Spirulina platensis biodiesel*. Energy, 2020. **193**: p. 116861.
146. Oni, B.A. and D. Oluwatosin, *Emission characteristics and performance of neem seed (Azadirachta indica) and Camelina (Camelina sativa) based biodiesel in diesel engine*. Renewable Energy, 2020. **149**: p. 725-734.
147. Lohan, S.K., et al., *Sustainability of biodiesel production as vehicular fuel in Indian perspective*. Renewable and Sustainable Energy Reviews, 2013. **25**: p. 251-259.
148. Kureel, R., et al., *Kokum a potential tree borne oilseed*. National Oilseeds and Vegetable Oils Development Board, India, 2009.

149. Bandara, D., et al., *Performance evaluation of the screw-type oil expeller for extracting mee (Madhuca longifolia) oil*. Journal of Biosystems Engineering, 2016. **41**(3): p. 177-183.
150. Orwa, C., *Agroforestry Database: a tree reference and selection guide, version 4.0*. <http://www.worldagroforestry.org/sites/treedbs/treedatabases.asp>, 2009.
151. Dalemans, F., et al., *Redesigning oilseed tree biofuel systems in India*. Energy Policy, 2018. **115**: p. 631-643.
152. Pragma, N., N. Sharma, and B. Gowda, *Biofuel from oil-rich tree seeds: Net energy ratio, emissions saving and other environmental impacts associated with agroforestry practices in Hassan district of Karnataka, India*. Journal of Cleaner Production, 2017. **164**: p. 905-917.
153. Awasthi, Y. and C. Mitra, *Madhuca latifolia.: Constituents of fruit pulp and nut-shell*. Phytochemistry, 1967. **6**(1): p. 121-125.
154. M.K. Dhakar, D.K.S., R.A. Kaushik, K.L. Kumawat, and S.S.a.A.K. Singh, *Mahua - Madhuca longifolia (Koenig) J.F. Macribide*, in *Breeding of Underutilized Fruit Crops*. 2015, Narendra Publishing House. p. 205-219.
155. SINGH, S. and A. SINGH, *Genetic diversity in malaua (Bassia latgolia) under semi-arid ecosystem of Gujarat*. 2005.
156. Badukale, N.A., et al., *Phytochemistry, pharmacology and botanical aspects of Madhuca indica: A review*. Journal of Pharmacognosy and Phytochemistry, 2021. **10**(2): p. 1280-1286.
157. İlkılıç, C., et al., *Biodiesel from safflower oil and its application in a diesel engine*. Fuel processing technology, 2011. **92**(3): p. 356-362.
158. Dhole, A., et al., *Effect on performance and emissions of a dual fuel diesel engine using hydrogen and producer gas as secondary fuels*. International Journal of Hydrogen Energy, 2014. **39**(15): p. 8087-8097.
159. Lal, S. and S. Mohapatra, *The effect of compression ratio on the performance and emission characteristics of a dual fuel diesel engine using biomass derived producer gas*. Applied Thermal Engineering, 2017. **119**: p. 63-72.
160. Shyamal Kumar Mondal, D.D.P., Jagdish, *Studies on Combustion of Hard Coke Using Different Additives*. International Journal of Applied Engineering Research, 2018. **13**(24): p. 16919-16926.
161. Singh, D.K. and J.V. Tirkey, *Modeling and multi-objective optimization of variable air gasification performance parameters using Syzygium cumini biomass by integrating ASPEN Plus with Response surface methodology (RSM)*. International Journal of Hydrogen Energy, 2021.
162. Sarvade, S., et al., *An overview of potential multipurpose agroforestry tree species, Syzygium cuminii (L.) Skeels in India*. Journal of Applied and Natural Science, 2016. **8**(3): p. 1714-1719.
163. Chakradhari, S. and K.S. Patel, *Combustion characteristics of tree woods*. Journal of Sustainable Bioenergy Systems, 2016. **6**(2): p. 31-43.
164. Longnecker, J.E., et al., *Method and system for controlling engine temperature by engine derating*. 2005, Google Patents.

Appendix

Table 4.5 Input and response variables from Aspen plus

Run	X ₁	X ₂	H ₂	CGE(%)		HHV(MJ/kg)		
	Temp	ER	ASPEN	Regression	ASPEN	Regression	ASPEN	Regression
1	600	0.2	0.1	0.101	13.44	13.2	3.45	3.449
2	600	0.4	0.08	0.084	25.2	25.23	3.22	3.19
3	900	0.4	0.08	0.088	29.8	30.11	3.77	3.82
4	900	0.6	0.06	0.064	41.07	41.34	3.44	3.43
5	600	0.6	0.07	0.0701	35.2	34.71	2.98	2.92
6	700	0.2	0.1	0.11	14.69	15.06	3.75	3.82
7	800	0.6	0.07	0.071	40.84	39.93	3.44	3.38
8	900	0.2	0.1	0.11	16.33	16.34	4.17	4.2
9	700	0.4	0.07	0.08	26.67	27.66	3.38	3.52
10	700	0.6	0.06	0.07	36.59	37.73	3.07	3.21
11	750	0.4	0.1	0.09	29.54	28.58	3.77	3.64
12	800	0.2	0.12	0.11	16.24	16.1	4.17	4.07
13	800	0.4	0.09	0.09	29.64	29.29	3.77	3.73

Table 4.23. ANOVA result for the Hydrogen concentration

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Model	6	0.139507	0.023251	214.89	0
Linear	3	0.074825	0.024942	230.52	0
TEMP	1	0.000094	0.000094	0.86	0.365
ER	1	0.07267	0.07267	671.64	0
S/B	1	0.000981	0.000981	9.06	0.008
Square	3	0.003699	0.001233	11.39	0
TEMP*TEMP	1	0.000078	0.000078	0.72	0.407
ER*ER	1	0.002186	0.002186	20.2	0
S/B*S/B	1	0.001317	0.001317	12.17	0.003
Error	18	0.001948	0.000108		
Total	24	0.141454			

Table 4.24. ANOVA result for the Cold gas efficiency

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Model	6	13391.1	2231.85	331.48	0
Linear	3	5257.9	1752.63	260.31	0
TEMP	1	2.1	2.12	0.32	0.581
ER	1	5218.9	5218.95	775.14	0
S/B	1	8.5	8.54	1.27	0.275
Square	3	964.1	321.36	47.73	0
TEMP*TEMP	1	0.8	0.8	0.12	0.734
ER*ER	1	937.7	937.7	139.27	0
S/B*S/B	1	2.6	2.62	0.39	0.54
Error	18	121.2	6.73		
Total	24	13512.3			

Table 4.25. ANOVA result for the Higher heating value

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Model	6	34.8077	5.8013	270.01	0
Linear	3	17.7225	5.9075	274.96	0
TEMP	1	0.001	0.001	0.04	0.835
ER	1	17.1065	17.1065	796.2	0
S/B	1	0.3292	0.3292	15.32	0.001
Square	3	1.2113	0.4038	18.79	0
TEMP*TEMP	1	0.0113	0.0113	0.52	0.478
ER*ER	1	0.8541	0.8541	39.75	0
S/B*S/B	1	0.3393	0.3393	15.79	0.001
Error	18	0.3867	0.0215		
Total	24	35.1944			