Asian American Engineer of the Year

Dr. Jaya Shankar Tumuluru

Senior Research Engineer
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Citation of Accomplishments

Significant contributions to the advancement of biomass preprocessing technologies and lowering cost for bioenergy production.

Dr. Tumuluru is a senior researcher in the particle mechanics group, Bioenergy Technologies Department, Clean Energy Technologies Division at Idaho National Laboratory (INL). Dr. Tumuluru is an accomplished research engineer and the principal investigator for the Biomass Size Reduction, Dying, and Densification Project, supported by the US Department of Energy's Bioenergy Technologies Office.

As a researcher, Dr. Tumuluru has developed technologies for efficient preprocessing of biomass, addressing key challenges to efficient biofuels production including high preprocessing cost and storage issues. Dr. Tumuluru has developed efficient moisture management techniques that can reduce the cost of preprocessing by 50% compared to the current state of technology. Technologies he has developed, including fractional milling, high moisture densification, and low temperature drying, have reduced the biomass pellet production cost by 65% compared to conventional industry method. The various research areas Dr. Tumuluru has worked in include a) biomass size reduction using different grinder and understanding changes in the physical properties like bulk density, particle size distribution, and specific energy consumption of the biomass grinds; b) densification of terrestrial, marine, and municipal solid waste biomass using briquette press and pellet mill; c) preheating, steam explosion, and torrefaction of the biomass to improve the densification, calorific value, and combustion characteristics; d) drying characteristics of raw and densified biomass; e) effect of chemical and thermal pretreatment on thermochemical and biochemical conversion; f) modeling of biomass preprocessing systems; g) development of scale-up methodology for high moisture pelleting process, and development of equipment to conduct tests on high moisture pelleting process; and h) biochemical and thermochemical conversion performance of raw, mechanical, chemically, and thermally pretreated biomass.

Dr. Tumuluru has published and presented more than 130 papers in national and international conferences, authored 10 book chapters, edited books on biomass preprocessing, and mentored 10 interns since joining INL in 2009, with h-index of 23 and 1743 citations. Since 2009, Dr. Tumuluru has submitted eight invention disclosures and has filed for one patent. Dr. Tumuluru is an editorial board member of the journal Carbon Resources Conversion and has acted as a guest editor for journals such as Energies, Bioengineering, and Journal of Energy. He manages over $1.5 M in annual funding in the field of biomass preprocessing.

Dr. Tumuluru received his Ph.D. from the Agricultural and Food Engineering Department at the Indian Institute Technology, Kharagpur, India. He also holds a master of technology degree from the Department of Food Science & Technology, Guru Nanak Dev University, India, and a bachelor of technology degree from the College of Agricultural Engineering, ANGR Agricultural University, India.