

The Conversion of Biomass to Liquid Fuel: Switchgrass Pyrolysis Process

Nantaporn Noosai¹, Khokiat Kengskool², Suneerat Pipatmanomai³

Abstract: A pyrolysis process model was developed for biomass (Switchgrass) pyrolysis in an atmospheric fluidized bed reactor using the ASPEN PLUS simulator. ASPEN PLUS is one of the most popular chemical process simulation software programs that have been used industrially and academically. In this study, the experimental data from previous works and kinetic reactions for pyrolysis process were used for the model development. The purpose of this study was to simulate the transformation of solid biomass, Switchgrass, into liquid fuel by using pyrolysis process. The conversion of biomass to liquid fuel was successfully predicted by the ASPEN Plus model. The simulation results showed that 2 types of liquid fuels were obtained from Switchgrass pyrolysis process at different fuel condensing temperatures. The low heating value (LHV) of liquid fuel NO.1 was ~ 17 MJ/kg while 30 MJ/kg was obtained from liquid fuel NO.2. The model results were comparable to the experimental works. Moreover, this pyrolysis process was designed to recover the process waste energy. Almost 80% of process waste energy recovery can be achieved and recycled within the process.

Keywords: Biomass pyrolysis; Switchgrass pyrolysis process; Aspen plus pyrolysis simulation; Solid fuel conversion; Biomass oil; Liquid oil

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¹ Civil and Environmental Engineering Department, FIU College of Engineering and Computing 10555 West Flagler St. EC3900 Miami, FL 33174, Nantaporn.Noosai@fiu.edu

² Energy Division, The Joint Graduate School of Energy and Environment, KMUTT, 126 Prachauthit Rd, Bangmod, Tungkr, Bangkok, Thailand 10140, suneerat_p@jgsee.kmutt.ac.th

³ Civil and Environmental Engineering Department, FIU College of Engineering and Computing 10555 West Flagler St. EC3900 Miami, FL 33174, kengskoo@fiu.edu

Authors:

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Nantaporn Noosai – received a Bachelor of Engineering degree in Environmental Engineering from Prince of Songkhla University, Thailand in 2002, and Master degree in Energy Technology and Management from the Energy Division of The Joint Graduate School of Energy and Environment, KMUTT, Bangkok, Thailand in 2008. Currently she is pursuing a Ph.D. in Environmental Engineering, Florida International University.

Khokiat Kengskool – received a Bachelor of Science degree in Industrial Engineering from Chulalongkorn University in Bangkok, Thailand in 1974, and Master Degree in Engineering Management from Missouri University of Science and Technology in 1976, and also Master and Ph.D. degrees in Industrial Engineering from the University of Missouri-Columbia in 1983 and 1986. Since 1986, he has been a faculty member in the Department of Industrial and Systems Engineering at Florida International University. His current research interests include Applied Artificial Intelligence, Decision-Making Support Systems and Productivity Enhancement.

Suneerat Pipatmanomai – received a Bachelor of Science degree in Chemical technology from Chulalongkorn University in Bangkok, Thailand in 1996, and Master and Ph.D. degrees in Chemical Engineering from Imperial College, London, UK in 1998 and 2002 respectively. Since 2004 she has been a faculty member in the Energy Division of The Joint Graduate School of Energy and Environment, KMUTT, Bangkok, Thailand. Her current research interests include Modeling of a biomass downdraft fixed-bed gasifier, The study of the effect of operating parameters on CFB combustion of lignite and low grade coals, Coal gasification simulating conditions of a high-pressure entrained flow O₂ gasifier, Improvement of bio-oil production from fast pyrolysis and bio-oil upgrading, Thermodynamic analysis and comparison of energy conversion systems, Integrated resource and technology for energy scenario planning in Thailand and Treatment and upgrading of synthesis gas and biogas for further utilization.