

## Equilibrium Modeling of a Two Stage Downdraft Gasifier Using Different Gasification Fluids

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**Abstract :** A mathematical model to investigate the performance of a two stage fixed bed downdraft gasifier operating with air, steam and oxygen mixtures as the gasifying fluid has been developed. The various conditions of mixtures for a double stage fluid entry, have been performed. The model has been validated through a series of experimental tests performed by NEST - The Excellence Group in Thermal and Distributed Generation of the Federal University of Itajubá. Influence of mixtures are analyzed through the Steam to Biomass (SB), Equivalence Ratio (ER) and the Oxygen Concentration (OP) parameters in order to predict the best operating conditions to obtain adequate output gas quality, once is a key parameter for subsequent gas processing in the synthesis of biofuels, heat and electricity generation. Results show that there is an optimal combination in the steam and oxygen content of the gasifying fluid which allows the user find the best conditions to design and operate the equipment according to the desired application.

**Keywords :** air, equilibrium, downdraft, fixed bed gasification, mathematical modeling, mixtures, oxygen steam

**Conference Title :** ICBB 2015 : International Conference on Biofuels and Bioenergy

**Conference Location :** Paris, France

**Conference Dates :** December 30-31, 2015