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Development of a simplified model for the design of CHP systems to operate on residual, low-value feedstocks

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Small-scale gasification coupled with an internal combustion engine for CHP generation is a well-explored method of bioenergy production. Several commercially available systems can be found across Europe. However, this kind of technology is typically designed to operate optimally and produce minimal tar only when clean, ideal feedstocks with a narrow distribution of moisture, size, and heating value are used. In Canada, the ability to utilize the abundant source of residual biomasses for CHP production would improve the economic case for these units significantly. Therefore, an adaptation of this kind of CHP system is required to be able to utilize alternative, low-value residual feedstocks and achieve optimal efficiency without excessive tar production. Several areas of development are required for the adaptation, which includes gasifier design, gas clean-up for tar removal, optimization of engine operation, and overall system integration. This presentation will discuss the utilization of a simplified kinetic/transport model for the design of gasifiers operating on residual feedstocks. Experimental data from a small-scale gasification CHP unit operating on residual woody biomasses such as construction and demolition waste, oriented strand board and chipped pallets are used to validate the developed model and will also be presented. The results show that the model has the ability to be used as a predictive design tool for gasifiers to achieve optimal carbon conversion and reduced tar production for various feedstocks that are relevant to Canada.

Biography

Jennifer Littlejohns completed her undergraduate degree at the University of Guelph in Biological Engineering and her PhD at Queen's University in Chemical Engineering where she investigated the three-phase bioreactor design for the treatment of industrial waste gases. Prior to joining the NRC, she gained over 8 years experience in the Biofuels and Biomanufacturing Industries as a Senior Development Engineer at Iogen Energy and Abbott Laboratories. She is currently a Research Council Officer and Program Technical Lead for the Bioenergy Program at the National Research Council.

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