

# DENSIFICATION OF WOODY BIOMASS FOR GASIFICATION FEEDSTOCK

## Objectives

This project was conducted to investigate the feasibility and economics of producing a woody biomass briquette that can be successfully utilized for feedstock in wood gasification systems to produce a tar free or low tar gas.

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## Project Partners

T.R. Miles Inc.

Heyes Forest Products Inc.

Beltomatic Inc.

Warn & Baerg Inc.

University of North Dakota; Energy & Environmental Research Center

Cubes in Combustion Zone of Gasifier as seen through Air Nozzle



## Methods

Green hardwood sawmill residue chips averaging 1/8 x 7/8 x 1 inches (2.8 x 19.8 x 34 mm) with a 40%-50% Moisture Content (MC) and an average weight of 14 lb/ft<sup>3</sup> (224 kg/m<sup>3</sup>) were dried on a grain type belt dryer to 10%-12% MC, milled with 5/8 in. (5.6mm) hammers through a 1 in. (33.8mm) screen, and then densified into a cubed product 1 1/8 in. x 1 1/8 in. x 2 in. (25mm x 25mm x 50mm) with an average weight of 32 lb/ft<sup>3</sup> (512 kg/m<sup>3</sup>). After successfully cubing the chips, the feedstock was sent to the University of North Dakota, Energy and Environmental Research Center in Grand Forks, North Dakota to be gasified in an Ankur gasification system.



Feedstock bin



1/8 in x 7/8 in x 1 in (2.8 x 19.8 x 34mm) CHIPS ON 5/8 in (5.6mm) GRID 40-50% MC 14 lb/ft<sup>3</sup> (224 kg/m<sup>3</sup>) dry



MILLED With 5/8 in Hammers (5.6 mm) THROUGH 1 in (33.8 mm) SCREEN 10%-12% MC



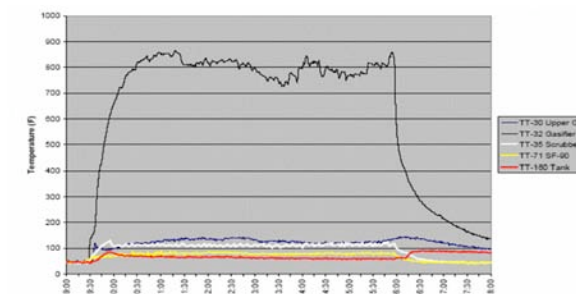
CUBED PRODUCT 1 1/8 in x 1 1/8 in x 2 in (25mm x 25 mm x 50 mm) 10% MC 32 lb/ft<sup>3</sup> (512) kg/m<sup>3</sup>

## Results

Gas quality improved using the cubed feedstock over the hardwood chips. However, gasifier efficiency was lower most likely due to a lack of optimization of the gasifier. The tests indicated favorable results firing wood cubes as the handling characteristics were positive: no bridging or plugging occurred in the system. Also, the gas heating value was high at 139.7 Btu/scf. Another important characteristic of this feedstock is that contaminant levels were low with particulate matter <2ppm and tar at 256ppm.



Cuber



System Temperatures

## Gas Production

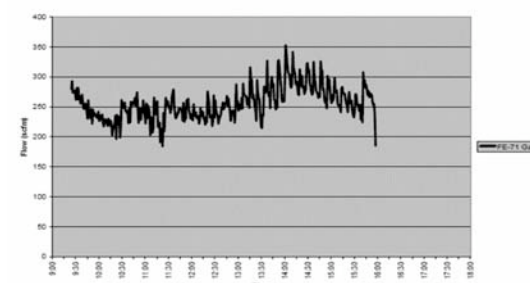


Figure 7 - Gas Flow Rate

## Conclusions

This project proves that wood cubes can be successfully processed from typical hardwood chips and converted to a gas suitable for engine application. In addition, the economics for wood cube production is justifiable, but the improvements for gasification relative to wood chips is minimal without fine tuning gasifier settings or efficiency of the process has the potential to decrease.

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