

Money Might Not Grow On Trees, But How About Electricity?





Introduction

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VS



CHALLENGES



- 1) **Average of 40 tons of Wood Waste per Year from Storm Debris**
- 2) **Emerald Ash Borer, Maple Chlorosis, and Pine Beetle are invading nearly 50% of the Trees in South Sioux City**
- 3) **Estimated cost of \$1.3 billion to remove, dispose and replace Ash trees across the State of Nebraska** (as reported by the Nebraska Department of Agriculture in a June 8, 2016 press release)



- 4) **In 2012, 502,000 acres of prairie and forest were lost in western Nebraska as a result of a large wild fire resulting in an expense of over \$12 million dollars in fire fighting expense alone**
- 5) **38,000 new acres of the invasive species of Red Cedar are recorded annually across the State of Nebraska. Due to their high BTU value, these trees are highly flammable and it's not a matter of when, but how bad the next wild/forest fire will be in Nebraska**

OPPORTUNITIES



- 1) Wood Waste is an ideal renewable biomass feedstock; having one of the highest BTU contents of all biomass**
- 2) An ideal use of dead, diseased and dying trees in South Sioux City and across Nebraska (or any state)**
- 3) A socially responsible, economically viable and sustainable resource**



EXPLORING THE OPTIONS



1) Landfill the Wood Waste and Debris



2) Convert the Wood to Mulch (not ideal or allowable for diseased or trees infested with Emerald Ash Borer)



3) Install a woody biomass boiler system in a Municipal Building



4) Search for a small scale Biomass Gasification System





WHAT IS BIOMASS GASIFICATION?

Gasification is a process that converts organic or fossil fuel based carbonaceous materials into carbon monoxide, hydrogen and carbon dioxide. This is achieved by reacting the material at high temperatures ($>700\text{ }^{\circ}\text{C}$), without combustion, with a controlled amount of oxygen and/or steam. The resulting gas mixture is called syngas (from synthesis gas or synthetic gas) or producer gas and is itself a fuel. The power derived from gasification and combustion of the resultant gas is considered to be a source of renewable energy if the gasified compounds were obtained from biomass

HISTORY OF BIOMASS GASIFICATION

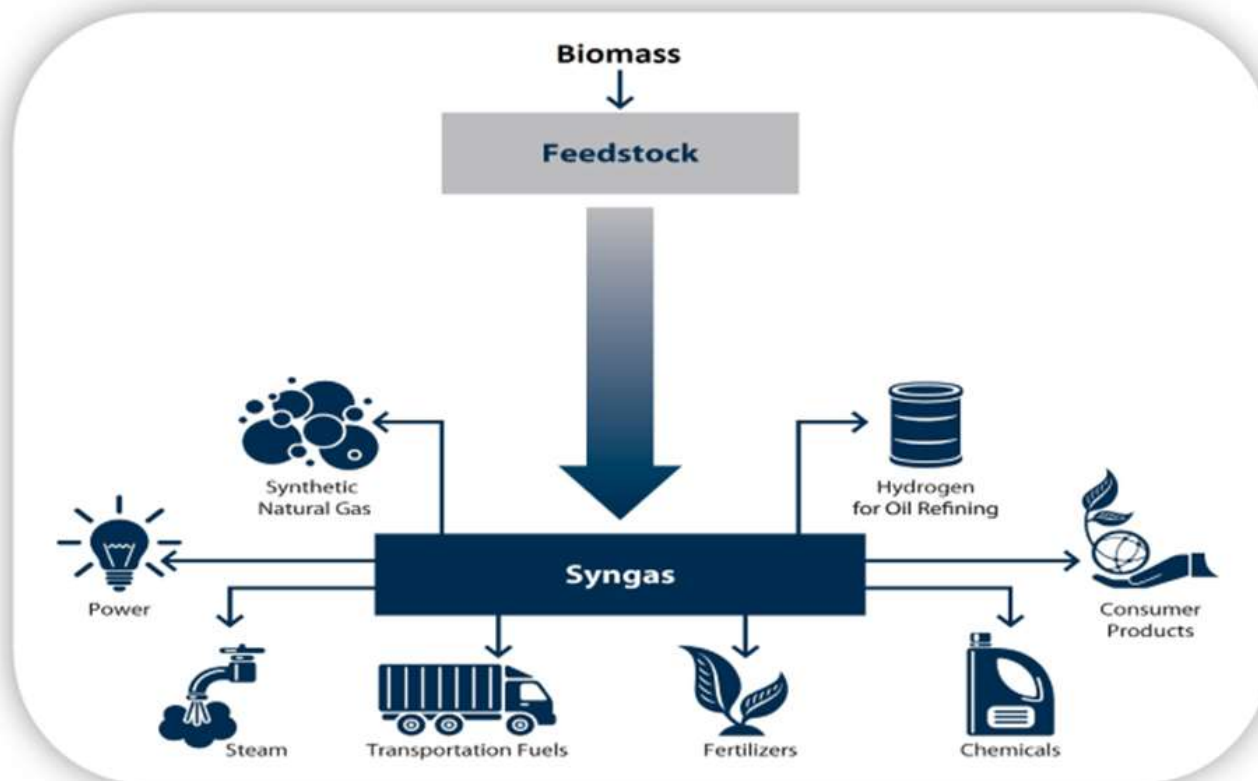


The process of producing energy using the gasification method has been in use for more than 180 years. In the early time coal and peat were used to power these plants. Initially developed to produce town gas for lighting and cooking in the 1800s, this was replaced by electricity and natural gas, it was also used in blast furnaces but the bigger role was played in the production of synthetic chemicals where it has been in use since the 1920s.

During both world wars, especially the World War II, the need for fuel produced by gasification reemerged due to the shortage of petroleum. Wood gas generators, called Gasogene or Gazogène, were used to power motor vehicles in Europe. By 1945 there were trucks, buses and agricultural machines that were powered by gasification. It is estimated that there were close to 9,000,000 vehicles running on producer gas all over the world.



BIOMASS GASIFICATION TODAY



BIOMASS GASIFICATION FOR SOUTH SIOUX CITY



For more information contact us at:

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PROJECT COST, SAVINGS & PAYBACK

Total Project Cost: \$216,410.52

Funding Sources: Nebraska Department of Environmental Quality & Trees Heat Nebraska (Nebraska Forest Service Program)



Estimated Annual Electric Savings: \$37,690

Simple Payback: 5.7 years

Life Expectancy: 10 years (long with regular service)

Annual Tons of Wood Waste Used: 913 tons

Impact to the Environment: ZERO





FUTURE AHEAD

3 MW Biomass Power Generation Plant

Biomass Research and Development Facility

Adapt Gasifier (large scale and small scale) to include CHP





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