

The Conversion of Waste to Biofuels as an Alternative Source of Energy

Introduction

The conversion of waste to biofuels is the latest innovation in alternative forms of energy.

It is the new form of recycling; the recycling of objects that were deemed impossible to recycle before. It takes the central environmental issue of modern times, the growing amounts of garbage and landfills, and diverts it into a form of energy. It takes one of the inevitable faults of living in the modern times and converts it into something useful. Something scientists and environmentalists have been worrying about and warning countries to reduce seems now a solved problem. There are many alternative sources that can provide electrical energy, electrical energy is easy to replicate. However, fuel energy is harder to replicate. The main source of fuel energy is fossil fuels. Biofuels on the other hand, are the largest step of innovative fuel energy. A once non-renewable source of energy has now become renewable because of biofuels. Though not perfect, biofuels reduces more waste than it produces. It takes garbage from landfills and through chemical processes, converts the waste into biofuels in the form of bioethanol,

biomethanol, and most commonly biodiesel. This essay will argue how the conversion of waste to biofuels reduces greenhouse emissions, creates economic gain, and paves a brighter future for Edmonton.

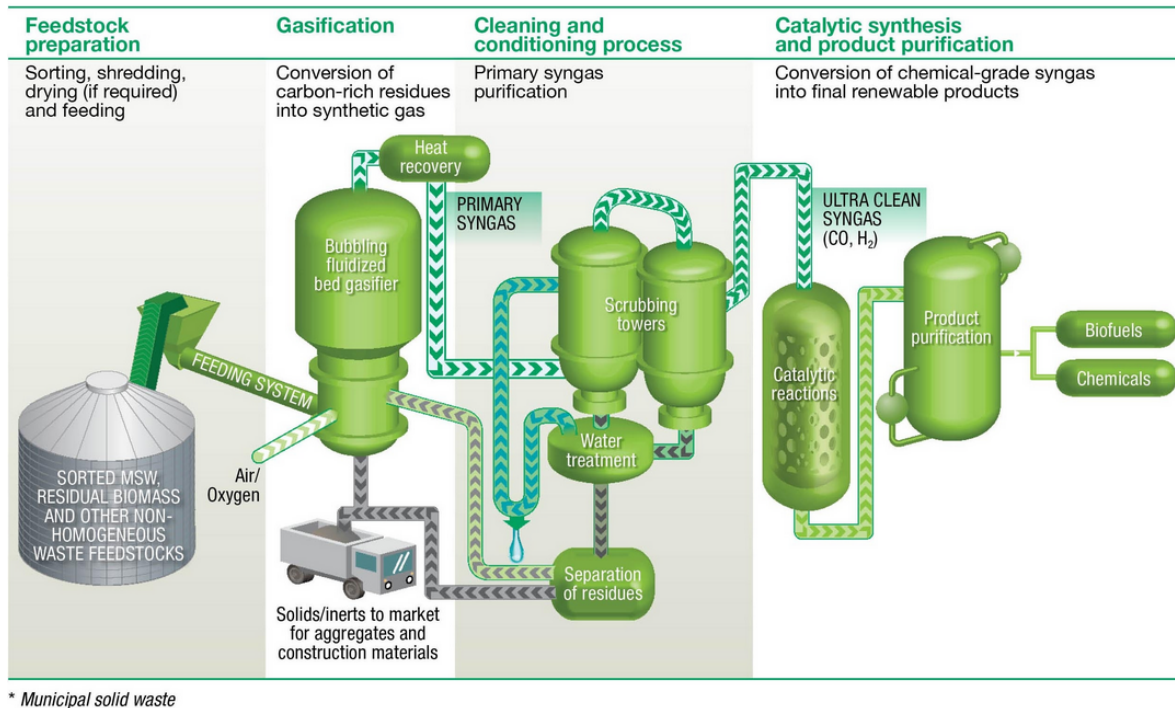


Figure 1: The Process of converting waste to biofuels.
http://www.edmonton.ca/for_residents/ENERKEM_Technology_2013.JPG

Reduced Emissions

Biofuels in the form of biodiesel have reduced greenhouse emissions as compared to fossil fuel based diesel. First of all, the process itself produces slim to none gas emissions. The process used, gasification, produces a stream of hydrogen, carbon monoxide, and small amounts

of carbon dioxide and methane. Rather than the gas produced being a waste that is released to the atmosphere, the gas itself is the product. The gas is then purified and after chemical processing, becomes biodiesel. The process of producing biodiesel creates almost zero greenhouse gas emissions as compared to diesel produced through fossil fuel burning. Secondly, it is important to note that biodiesel works similar if not the same to diesel except that when used as engine

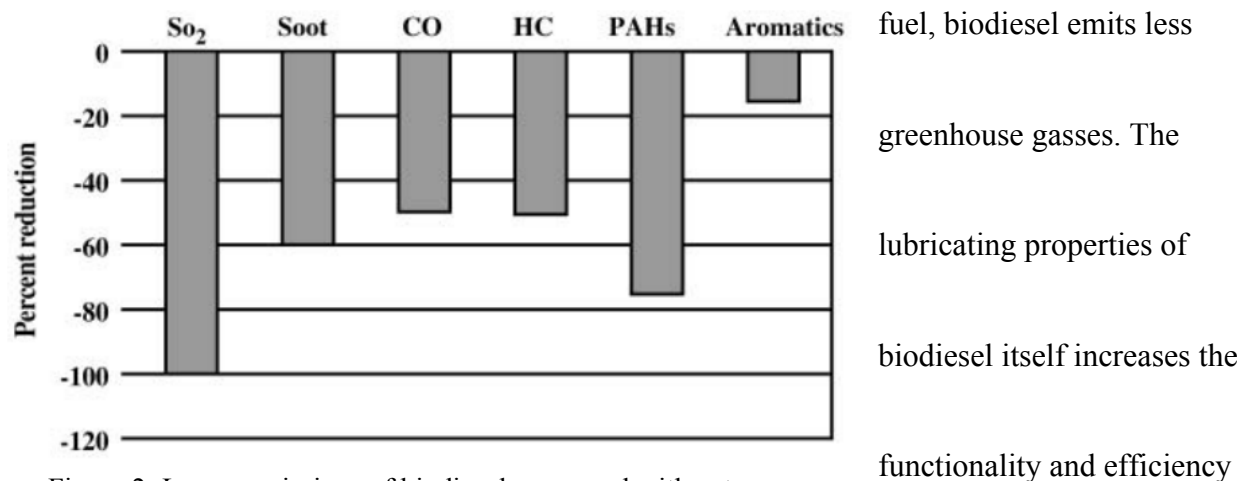


Figure 2: Lower emissions of biodiesel compared with petro-diesel. [1]

of the engine. The use of biodiesel in the engine creates for a smoother and quieter engine and produces less smoke. It is a fact that biodiesel can fully replace petro-diesel in all kind of diesels run engines and performs just as well with no negative impacts. Studies have shown that petro-diesel emits 2.6 kg of CO₂ per kg of diesel as compared to the 1 kg of CO₂ per kg of biodiesel. The sulfur content of

biodiesel is also 20%-50% that of petro-diesel. The emission also has less SO₂, CO, and hydrocarbons such as HC and PAH. It also has less soot(smoke) and far less of an aroma. [1,2]

Economic Gain

The production and use of biofuels creates huge economic gain. The production process of biofuels usually does cost extra in terms of transportation of the waste. In the case of Edmonton's new waste to biofuels facility, the processing plant is situated right beside the landfill and the waste is transported through a conveyor belt. The only expense in transportation already comes from moving the waste from the residential areas to the landfill site. According to a study made by the European Commission, production of biofuels in Europe equivalent to only

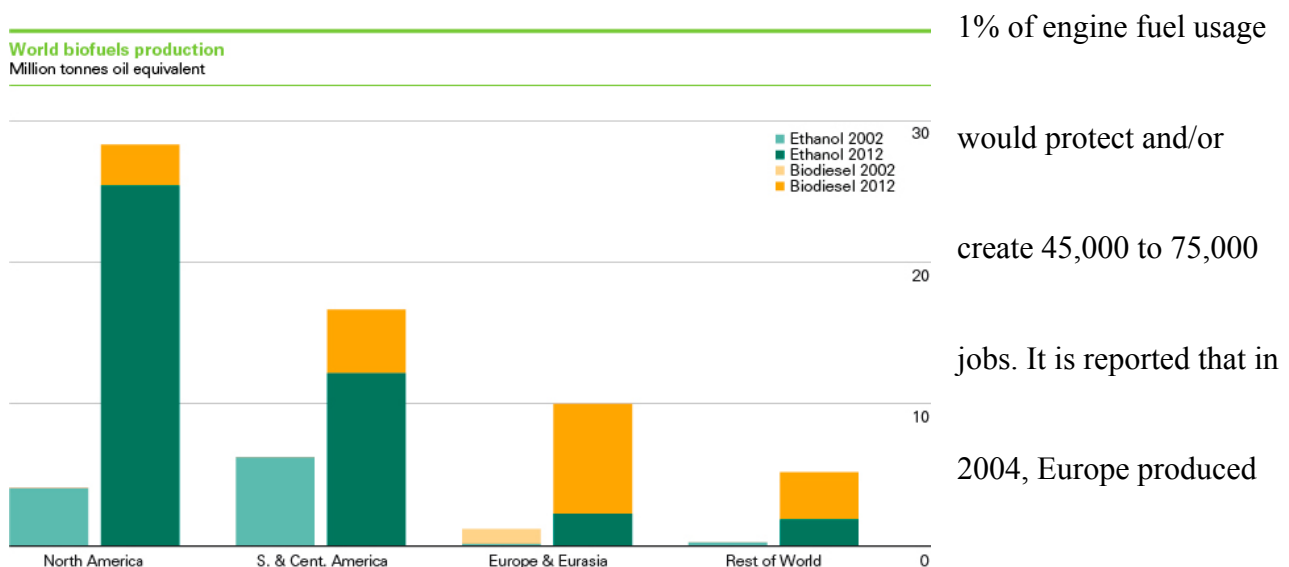


Figure 3: World Biofuels Production in 2012.

<http://www.bp.com/content/dam/bp/images/core-editorial-main/World%20biofuels%20production-bar.jpg>

around 2.9 billion liters of biofuels; 2.3 billion L of biodiesel and 620 million L of bioethanol.

By 2010, it was expected to have doubled. Currently, North America is the leader in biofuels production by a huge margin with South America placing second, and Europe and Asia placing third. The price of biodiesel fuel has a competitive price when compared to petro-diesel while costing less to produce. This introduction of waste to biofuels facilities is creating increased investment in further research, plantations, and equipment. It also allows for creation and security of jobs. Because of its environmental benefits, governments in Europe and the USA are giving tax reductions to facilities that produce biofuels. Since waste is always readily available, there is no longer any dependency on the availability of petroleum. [2, 3]

Future of Edmonton

Biofuels are paving a new path for the future of fuel energy and the cities and countries that take part in its production and use. Edmonton is the first in the world to open a full scale industrialized biofuel facility headed by Enkema Alberta Biofuels. Since the late 2011, it converted 100,000 tons of solid waste into over 36 million liters of biofuels. The facility itself was an \$80 million investment. The facility is part of a larger initiative totaling \$131 million and

includes feedstock preparation facilities and research facilities. It is expected to produce 36 million liters of biofuels each year. It will reduce Edmonton's greenhouse emissions and CO₂ emissions by 6 million tons over the next 25 years. That is equivalent to removing 42,000 cars off the road every year equating to 1.05 million cars overall. By 2016, it is expected that Edmonton will have diverted around 90% of its landfill into biofuels. This percentage is astonishing and is paving the way for a greener Edmonton. With the landfill expecting to close, the biofuel alternative will prevent Edmonton from opening a new landfill site and potentially costing Edmontonians more to transport waste to the new landfill. The building of the facility alone created 50 permanent direct and indirect jobs and its number is expected to rise with its opening. This new facility is raising the prestige of Edmonton's waste management and energy conversion. Edmonton's waste management site is already a world leader with multiple facilities for recycling and disposal. The fact that this new biofuel facility is North America's first commercialized waste to biofuel facility and the world's first full scale industrialized facility is a ground making mark on Edmonton's pioneering advanced energy alternative. This new waste to biofuel facility will provide the citizens of Edmonton with a clean alternative to landfilling and with cleaner biodiesel engine fuels. [3]

Conclusion

The innovative conversion of waste to biofuels paves way for a more eco-friendly alternative source of energy. It takes a common modern day issue and turns it into something useful. Fuel energy is used every day and its high dependency makes it almost impossible to diminish. Biofuels offers a new alternative to fuel energy dependent systems. Its production is clean and its emission is remarkably cleaner when compared to petroleum fuels. Its innovative and eco-friendly characteristics are persuading countries into taking part in its production and usage. The new waste to biofuel facility in Edmonton is cementing Edmonton's leadership in biofuel production and is creating a greener city. In conclusion, the conversion of waste to biofuels is an innovative source of fuel energy that reduces greenhouse emissions, creates economic gain, and is paving a brighter future for Edmonton.

References:

[1] D. Bajpai and V.K. Tyagi, "Biodiesel: Source, Production, Composition, Properties and its Benefits", Journal of Oleo Science, May 26, 2006, v55, n10 p. 487-502 in Engineering Village (Database on University of Alberta Libraries)

[2] A. Demirbas, "Biofuels Securing the Planet's Future Energy Needs", Energy Conversion Management, September 2009, v50, n9 p. 2239-2249 in Engineering Village (Database on University of Alberta Libraries)

[3] Eric Loveday, "Edmonton Will Go From Trash to Gas in 2011 Thanks to Enerkem Alberta Biofuels", <http://green.autoblog.com/2010/09/09/edmonton-will-go-from-trash-to-gas-in-2011-thanks-to-enerkem-alb/>, September 9, 2010.