

# Fluff to Green Energy

## **Research and Development:**

The main focus and most exciting area of research at this time is energy. Today oil and coal provide the energy to power the World's economy; however, both are finite commodities that won't last forever.

Oil production in the United States has already peaked (1976) and the noted geologist King Hubbard, who accurately predicted the US peak, also predicted that the World's oil production would peak in 2005. The most publicized fact in the current news is that energy prices are increasing and the "hunt is on" for new sources of energy.

A second world wide problem is the disposal of waste for a growing population that is demanding more goods and services and thus producing more waste. What are the opportunities for the WastAway process in this scenario? Can it help move the World beyond a petroleum based economy?

## **The Production of Ethanol from Biomaterials:**

Fermentation processes that use natural enzymes to break down commercially grown grains such as corn into simple sugars and then ferment these sugars to ethanol have been used for centuries. Grapes to wine, barley to beer, and corn to moonshine are all very old processes.

Currently, five billion gallons of ethanol are being produced to provide fuel, gasohol, for vehicles in the United States; however, the total economic picture of growing corn, to convert to ethanol, to power vehicles is very questionable. In the United States the total energy required to plant, fertilize, harvest, transport, store and process the corn to produce one gallon of ethanol requires 65 to 75 % of the energy available in a gallon of ethanol.

The federal and state subsidies provide the economic justification for the corn to ethanol production in the United States; plus it lowers our dependence on foreign oil. In some other countries, notably Brazil, with different growing seasons and labor cost, the economics are much better.

Preliminary test by a leading ethanol researcher at a major university have shown that the "fluff" produced from MSW by the WastAway process has a conversion rate of Biomass to ethanol of over 80% of the theoretical yield. Other biomass to energy researchers readily conclude that converting cellulous materials like "fluff" to energy is a proven technology and the focus needs to be on selecting the best feed stocks and most economically processes. Some advantages of converting "fluff" to ethanol are:

The WastAway process that converts a Ton of MSW into "fluff" requires less than 20% of the energy available in a ton of "fluff". A much better energy balance than the corn to ethanol process.

The pollution of the atmosphere by gases escaping from MSW stored in a landfill is avoided. Significant credits are available in many countries.

Corn is harvested during a 60 day period in the fall and must be stored for use during the remaining 10 months; however, MSW is available at a steady rate 365 days per year. "Fluff" is not biologically unstable like MSW and can be stored if required.

## **Gasification of Biomaterials:**

Conceptually, gasification is a relative simple process that converts a solid to a gaseous state. A carbonaceous fuel feed stock is co-fed with water, fuel and oxygen in a reducing atmosphere and at high pressure to convert and produce simple gases (carbon monoxide, hydrogen, methane, etc.) It is a proven technology that dates back to the late 19<sup>th</sup> Century and was widely used in Europe during World War II. However, the low coal, oil, and natural gas prices during the last half of the 20<sup>th</sup> Century eliminated the need for energy produced from gasification on the open market.

If the Global issues relating to the environmental impact, and the total energy used in extracting, growing, transporting, storing, and processing feed stock for energy production are considered, facilities using biomass as the feed stock are fifty times more efficient than current coal or gas fired electrical generating facilities. If the biomass feed stock is residue that requires disposal in a landfill, the benefits are even greater.

Laboratory tests and preliminary field tests of “fluff” in two different types of gasifiers have provided very encouraging results. Most gasifiers currently use coal, or biomass materials such as wood chips, rice straw, chicken manure or similar waste materials as the raw material for gasification. Some advantages of using “fluff” are:

Steady year-around availability. Supplies of MSW are available 365 days per year. Other biomass raw materials are seasonal; even wood chips.

High energy content. “Fluff” has an energy content of over 9,000 btu per pound. Wood varies from 6,000 to 7,000 btu per pound.

The green moisture content of “fluff” (30-35%) is in the ideal range for most gasifiers.

Energy produced from “fluff” is classified as “Green Energy” and commands a premium in US markets.

Using “fluff” (processed MSW) saves landfill space and protects the environment.

“Fluff” is not biologically active like MSW but is pathogen free, the garbage odor is gone, and it can be stored easily.

Today, numerous gasification facilities are scattered across the United States, but the majority are small and only supply “in house energy” to wood processing plants or facilities with access to a cheap and steady source of wood scraps.

## **Coal Gasification and “Fluff”:**

Coal gasification has a high efficiency, is the cleanest of all coal-based electric power technologies and has a lower carbon dioxide emission to the atmosphere.

Gasification also is the only economically feasible route for producing hydrogen from coal and many scientist are predicting that ultimately hydrogen powered vehicles are the best solution to the World’s energy problems.

When the total energy balance is considered, mining and transporting coal consumes energy and the energy expended in producing “fluff” is roughly equivalent to the energy required to landfill the MSW; therefore gasification of ‘ fluff should be very competitive with the gasification of coal..