# Biofuels from Sugar Beets

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The beet pulp left over from sugar production is rich in 5-carbon (C-5) and 6-carbon (C-6) sugars that are ideal for the production of advanced biofuels. Currently, it is sold as low-value animal feed. The potential yield of US beet pulp produced advanced biofuels is as follows.

## US Annual Beet Pulp Biofuel Potential

International production, located primarily in Europe with new plants being built in Turkey and China, is about 2 ½ times US yields.

In addition, the sugar beet industry also has many built in production advantages that favor the production of high-performance fuels at existing sugar beet processing plants. These include:

| Beet Pulp Composition | Beet Pulp Composition (%) | US Production (Dry Tons) |
|---|---|---|
| Methanol & Acetic Acid | 5.0% | 100,000 |
| | | |
| Pectin | 19.0% | 500,000 |
| Xylose / Hemicellulose | 16.0% | 400,000 |
| Arabinose/Hemicellulose | 16.0% | 400,000 |
| Total Hemicellulose | 32.0% | 800,000 |
| Cellulose | 20.0% | 400,000 |
| Total Available Cellulose/Hemicellulose/Pectin (C-5/C-6) Feedstock | 71.0% | 1,700,000 |
| | | |
| Potential @ 30% Conversion | | 145,000,000 Gals/Yr |
| Potential @ 50% Conversion | | 240,000,000 Gals/Yr |

Relatively low economic value of beet pulp biomass as compared to corn or other food-quality feedstocks.

Large quantities of beet pulp are already concentrated at a limited number of processing plants. No additional feedstock transportation costs are needed.

Sugar beet plants are concentrated in the Upper Midwest, with many plants near existing Air Force bases for bio-JP-8.
Relatively high sugar extraction temperatures, $60^0$C+, allow for fast enzymatic processing.
Sucrose extraction diffuser technology is adaptable to biorefinery and biofuel processes.
Sugar beet processing plants have water processing and steam production facilities in place. Initial infrastructure costs would be reduced.

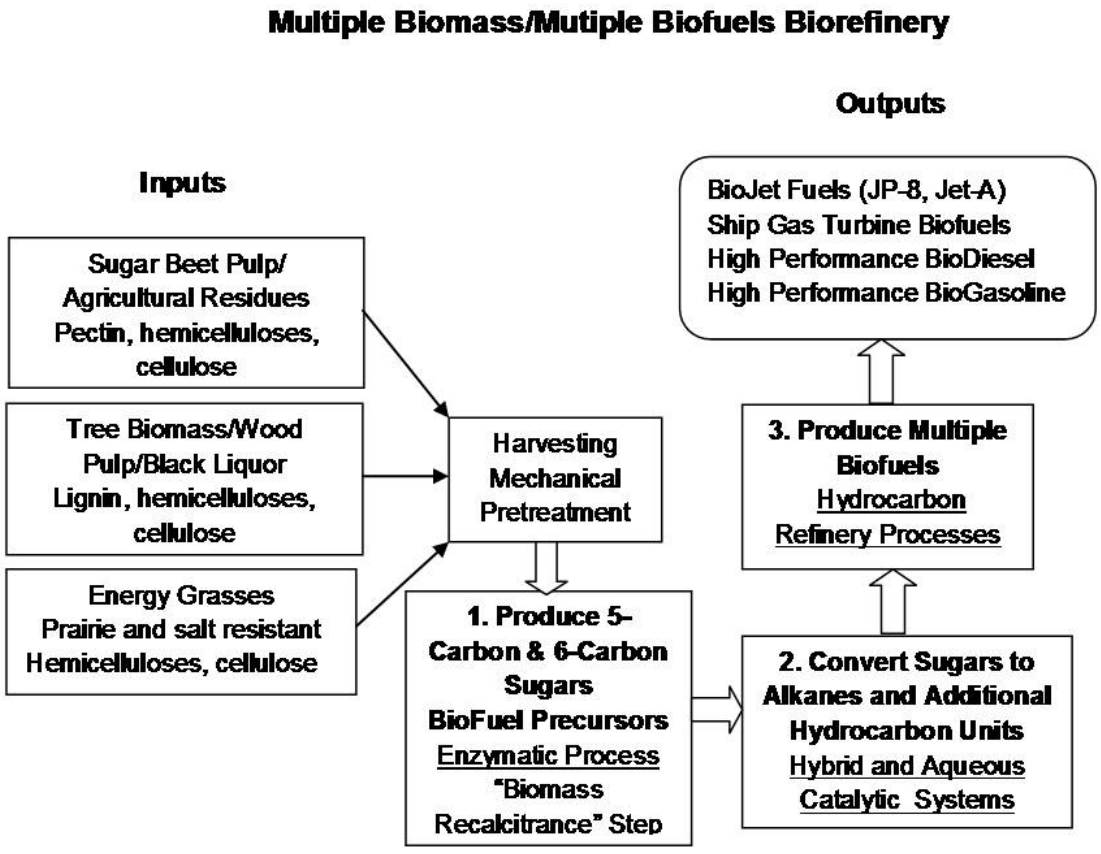
### Converting Sugar Beet Pulp to Biofuels: The Atlantic Biomass Process

Atlantic Biomass is currently developing “evolved” enzyme sets to release C-5 and C-6 sugars from low-value plant biomass that can be used as biofuel precursors. The sugars released through this process would be ideal inputs for aqueous-phase JP-8 production and other advanced biofuel processes.

Atlantic Biomass Conversion's first project is the utilization of sugar beet pulp which remains AFTER the food-value sugar is extracted. Biomass conversion would take place in-line at sugar beet processing plants. The Atlantic Biomass in-line enzymatic systems will take advantage of the sugar beet processing temperatures of $60^0$C to speed up reaction times. Atlantic Biomass is currently testing and modifying the enzymes that will be used with the pulp.

*It is important to note that no genetically modified organisms will be used in the sugar beet or other processing plants.*

The following diagram shows how the Atlantic Biomass enzymatic system would be integrated into a complete JP-8 biorefinery based on sugar beet pulp.



The sugar beet pulp system is the first step. Atlantic Biomass is also working to adapt our process to sorghum and to perennial energy grasses. In addition, preliminary work has begun on the processing of hemicellulose residues from the pulp and paper industries. Yields of energy grasses and residues from the pulp and paper industry dwarf sugar beet production. The first company to commercialize a sustainable, cost-effective system to use these sources for advanced biofuels would be guaranteed a sustainable annual income in the Billion dollar range.

*For more information about Atlantic Biomass Conversions, Inc., contact Bob Kozak at AtlanticBiomass@aol.com.*