

Northwest Missouri State University

Lessons Learned About Bioenergy

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Northwest Missouri State University is a state-assisted, four-year regional university

Founded in 1905

Located in Maryville, Missouri, a rural community of 10,000 (*90 miles north of Kansas City, 100 miles south of Omaha, 140 miles southwest of Des Moines*)

- 6574 Total Enrollment
- 5494 Undergraduate students
- 1080 Graduate students

Total Number of Employees: 855

Residents - 2400

Wood and Paper as Renewable Sources of energy

- Early 1980s
- It all started with sawmill residue
- No mills in the county, but residue available from Kansas City to Omaha along the Missouri River
- Unusual technology for the prairie region

WOOD CHIPS TO ENERGY



Throughout the year, wood chips are hauled to Northwest and stored by the Processing Plant until needed at the Boiler Plant. Approximately 1,700 tons of wood chips are stock piled at present, but over 3,000 tons can be stored if needed. Wood chips provide approximately 5,000 BTU's per lb. and account for approximately 70% of Northwest's energy needs.

WOOD CHIPS TO ENERGY



Northwest hauls all of its wood chip needs in walking trailer beds that hold up to 25 tons of material.

SOLID FUEL TO ENERGY



The wood chip silo stores 200 tons of material that is used in the larger wood boiler at a maximum rate of 75 tons per 24-hour day.



SOLID FUEL TO ENERGY

The larger of Northwest's solid fuel boilers burns mainly woodchips, but feedstock may also become a fuel source for it. On an average year, this boiler burns approximately 12,000 tons of woodchips to produce approximately 165,000 mmBTU's of energy.

SOLID FUEL TO ENERGY



Northwest's smaller solid fuel boiler is capable of burning paper pellets, wood chips, and feedstock pellets. Presently, it burns on average 3,000 tons of paper pellets to produce 32,000 mmBTu's of energy.

Storage bins for the smaller solid fuel boiler holds approximately 50 tons of paper pellets that would only last for one day when the boiler is operating at its maximum capacity.



WASTE PAPER TO ENERGY

- Pellet plant began in 1993
- All Northwest's paper plus
 - Trash haulers
 - Local industries
 - Residential drop-off

WASTE PAPER TO ENERGY

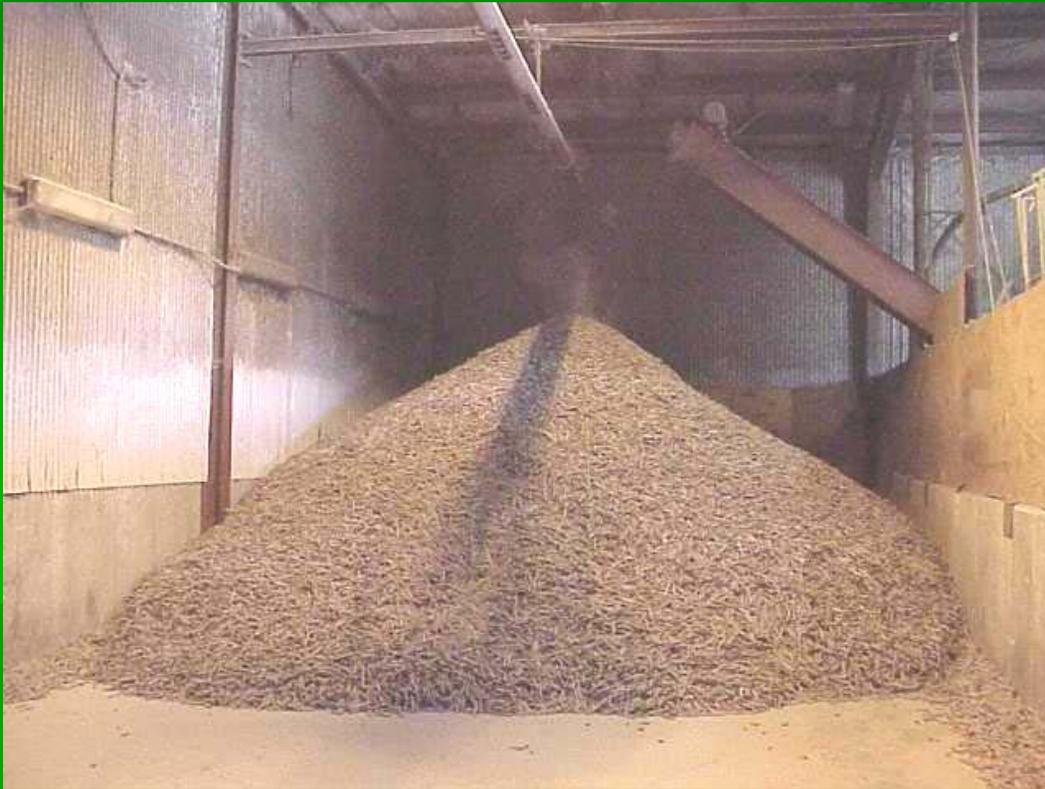


Raw waste paper is delivered to the processing plant for pelletization.

The raw paper is first ground into a fine fluff then pelletized at a rate of 1 1/2 to 2 tons per hour.



WASTE PAPER TO ENERGY



After being pelletized, the waste paper is in 3 inch by 5/8 inch pellets that can now be easily handled and burned. Paper pellets produce approximately 8,000 BTU's per lb. of material.

**- YET ANOTHER ALTERNATIVE –
FEED STOCK TO ENERGY**



Cattle waste provides 1/3 of the feed stock material that will be pelletized and burned to produce approximately 5% of the University's total energy need..

FEED STOCK TO ENERGY



Hoop shed for collection and blending of solid waste material (cattle, swine, poultry) with sawdust and/or switch grass.

FEED STOCK TO ENERGY

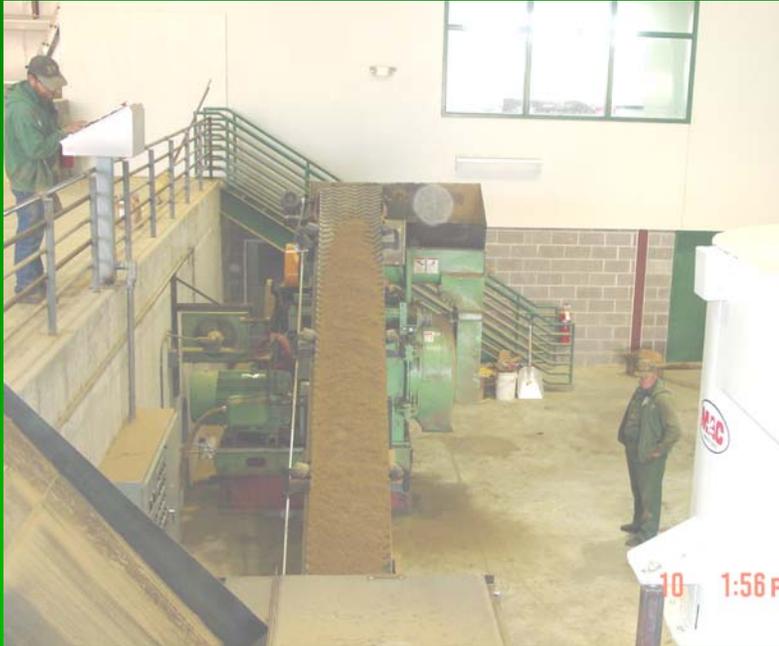


Inside the hoop shed, feed stock is air dried and mixed with saw dust. This process virtually eliminates the noxious odor normally associated with feed stock material.

Once dried, the feed stock blend looks like dirt and is hauled to the processing plant for pelletization.



FEED STOCK TO ENERGY



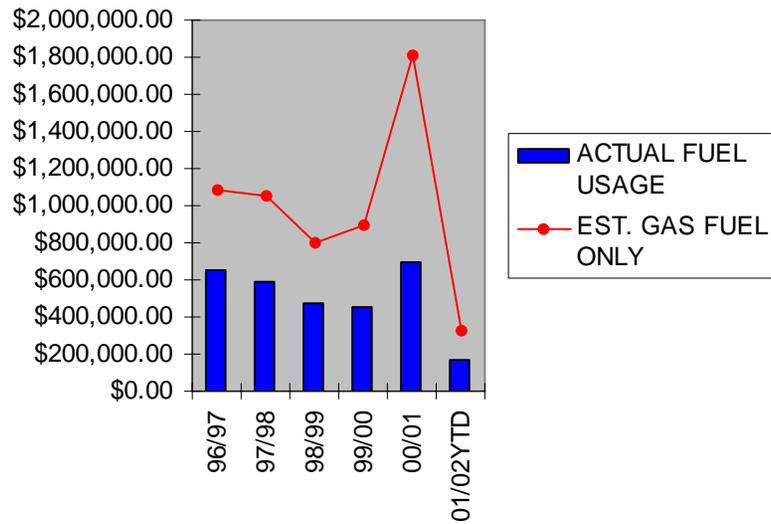
Feed stock is pelletized into 3 inch by 1/2 inch pellets so it can be easily handled.

It is anticipated that feed stock pellets will produce approximately 5,000 mmBTU's per lb. of material.

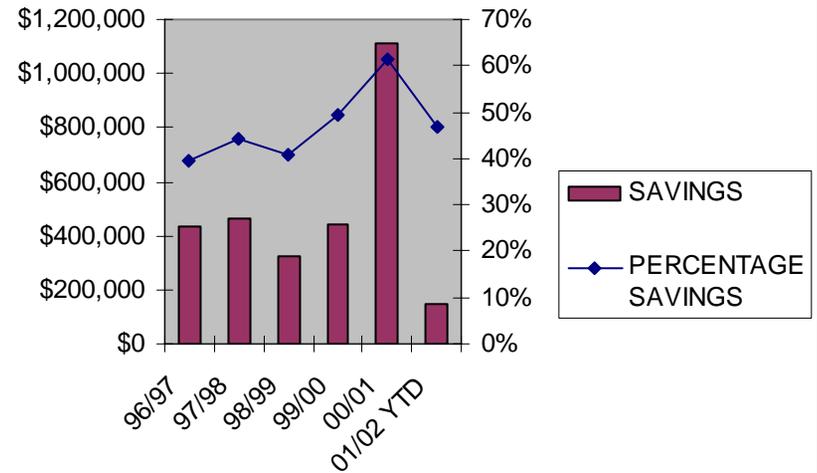


SOLID FUEL TO ENERGY

FUEL COST COMPARISON \$

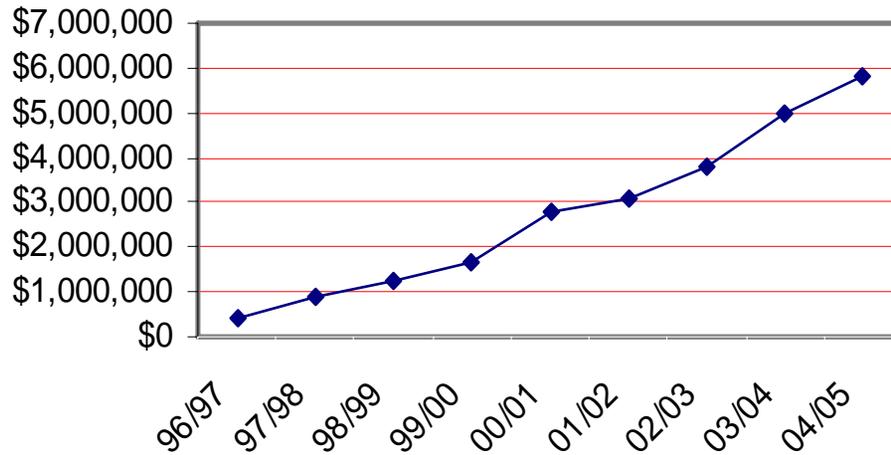


SAVINGS FROM USE OF ALTERNATIVE FUEL



SOLID FUEL TO ENERGY

ALTERNATIVE FUEL CUMULATIVE SAVINGS





Grand Champion 2005

Rank	School Name
1	Cal State San Marcos
2	Kalamazoo College
3	Point Loma Nazarene University
4	Colorado State University
5	Northwest Missouri State University